



Chapter 8

Motor Vehicles

This chapter summarizes needs for the motor vehicle system for both the existing and future conditions in the City of Beaverton. This chapter also outlines the criteria to be used in evaluating needs, provides a number of strategies for implementing automobile and truck plans and recommends automobile and truck plans for the City of Beaverton. The needs, criteria and strategies were identified in working with the City's Traffic Commission, the public and Technical Advisory Committee. The Traffic Commission and public explored automobile and truck needs in the City of Beaverton and provided input about how they would like to see the transportation system in their city develop. The Motor Vehicle modal plan is intended to be consistent with other jurisdictional plans including Metro's *Draft Regional Transportation Plan (RTP)*, Washington County's *Transportation Plan (Comprehensive Plan Volume XV)* and *Draft Bikeway Plan*, and ODOT's *Oregon Transportation Plan (OTP)*.

The motor vehicle element of the TSP involves several elements as shown in Figure 8-1. This chapter is separated into the following ten sections:

- Criteria
- Functional Classification (including summary of cross sections and local street connectivity)
- Circulation and Capacity Needs
- Safety
- Maintenance
- Neighborhood Traffic Management
- Parking
- Access Management
- Transportation System Management/Intelligent Transportation Systems
- Truck Routes

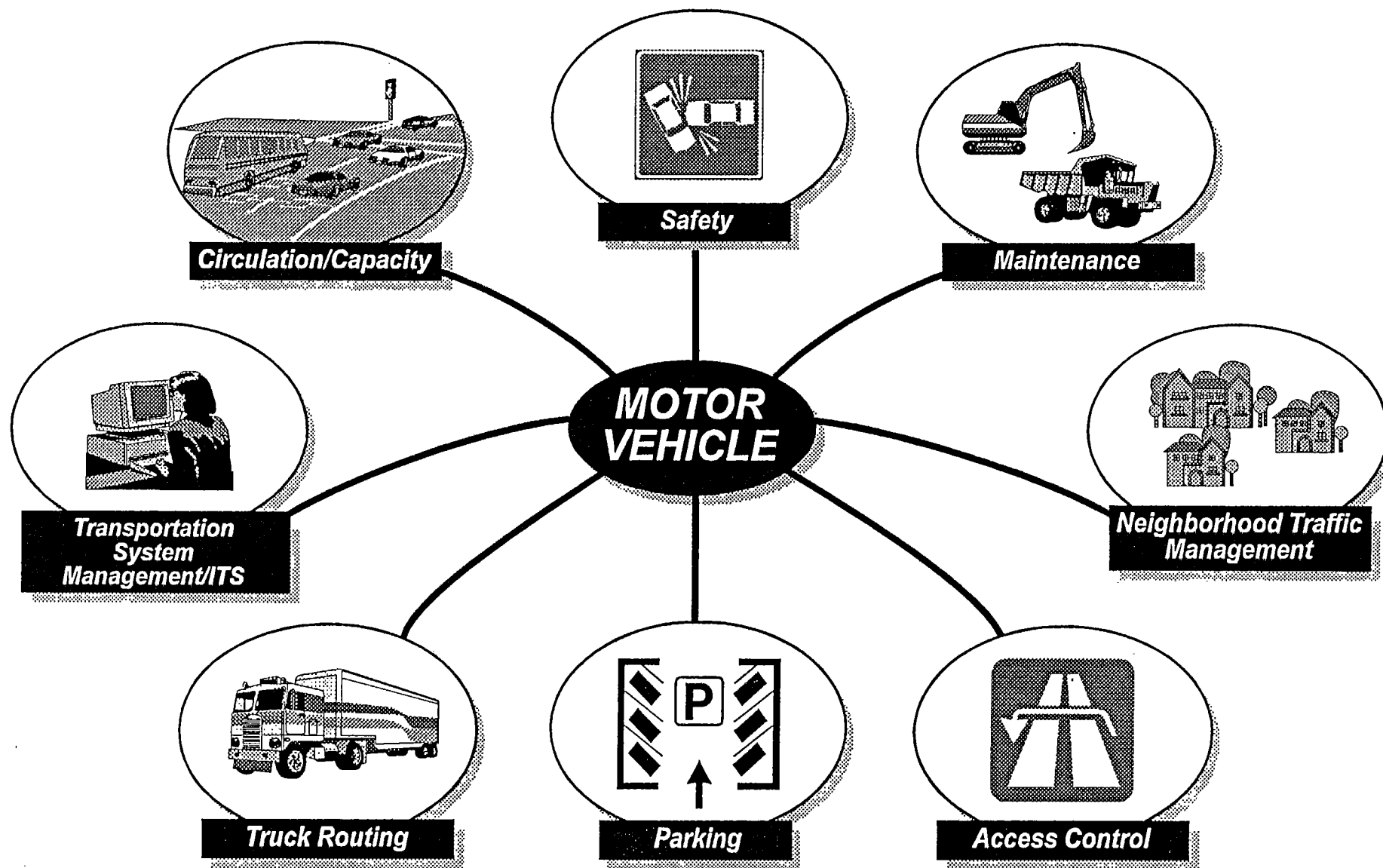


Figure 8-1
VEHICULAR ELEMENTS OF THE STREET PLAN

CRITERIA

Beaverton's Traffic Commission, the public and Technical Advisory Committee created a set of goals and policies to guide transportation system development in Beaverton (see Chapter 2). Many of these goals and policies pertain specifically to motor vehicles. These goals and policies **are** the criteria that all motor vehicle improvements or changes in Beaverton should be measured against to determine if they conform to the intended direction of the City. The most significant of these criteria is the level of service requirements outlined in Goal 4 Policy 3. These are used to determine adequacy of motor vehicle facilities.

Goal 1, Policy 1: Maintain the livability of Beaverton through proper location and design of transportation facilities.

Goal 1, Policy 2: Include noise attenuation in the design (including redesign and reconstruction) of arterial streets immediately adjacent to residential development.

Goal 1, Policy 5: Protect neighborhoods from excessive through traffic and travel speeds while providing reasonable access to and from residential areas. Build local, neighborhood and collector streets to minimize speeding.

Goal 1, Policy 6: Require new commercial development to identify traffic plans for residential streets where increased cut-through traffic may occur.

Goal 2, Policy 1: Develop and implement public street standards that recognize the multi-purpose nature of the street right-of-way for utility, pedestrian, bicycle, transit, truck, and auto use and recognize these streets **as** important to community identity **as** well **as** providing a needed service.

Goal 2, Policy 2: Provide connectivity to each area of the City for convenient multi-modal access.

Goal 3, Policy 1: Improve traffic safety through a comprehensive program of engineering, education and enforcement.

Goal 3, Policy 2: Design streets to serve their anticipated function and intended uses as determined by the comprehensive plan.

Goal 3, Policy 3: Enhance safety by prioritizing and mitigating high accident locations within the City.

Goal 3, Policy 4: Establish rights-of-way at the time of site development and officially secure them by either an easement or dedication of property.

Goal 3, Policy 5: Designate routes to schools for each school and any new residential project.

Goal 3, Policy 7: Provide satisfactory levels of maintenance to the transportation system in order to preserve user safety, facility aesthetics and the credibility of the system as a whole. Preservation, maintenance and operation requirements should be the first priority of transportation funds.

Goal 3, Policy 8: Maintain access management standards for arterial and collector roadways consistent with City, County and State requirements to reduce conflicts between vehicles and trucks, as well as conflicts between vehicles and pedestrians.

Goal 4, Policy 2: Limit the provision of parking to meet regional and state standards.

Goal 4, Policy 3: Maintain level of service consistent with regional goals. Reduce traffic congestion and enhance traffic flow through such measures as intersection improvements, intelligent transportation systems and signal synchronization.

Goal 4, Policy 4: Plan land uses to increase opportunities for multi-purpose trips (trip chaining).

Goal 4, Policy 5: Require land use approval for proposals for new or improved transportation facilities including identification of potential impacts.

Goal 5, Policy 1: Construct transportation facilities to meet the requirements of the Americans with Disabilities Act.

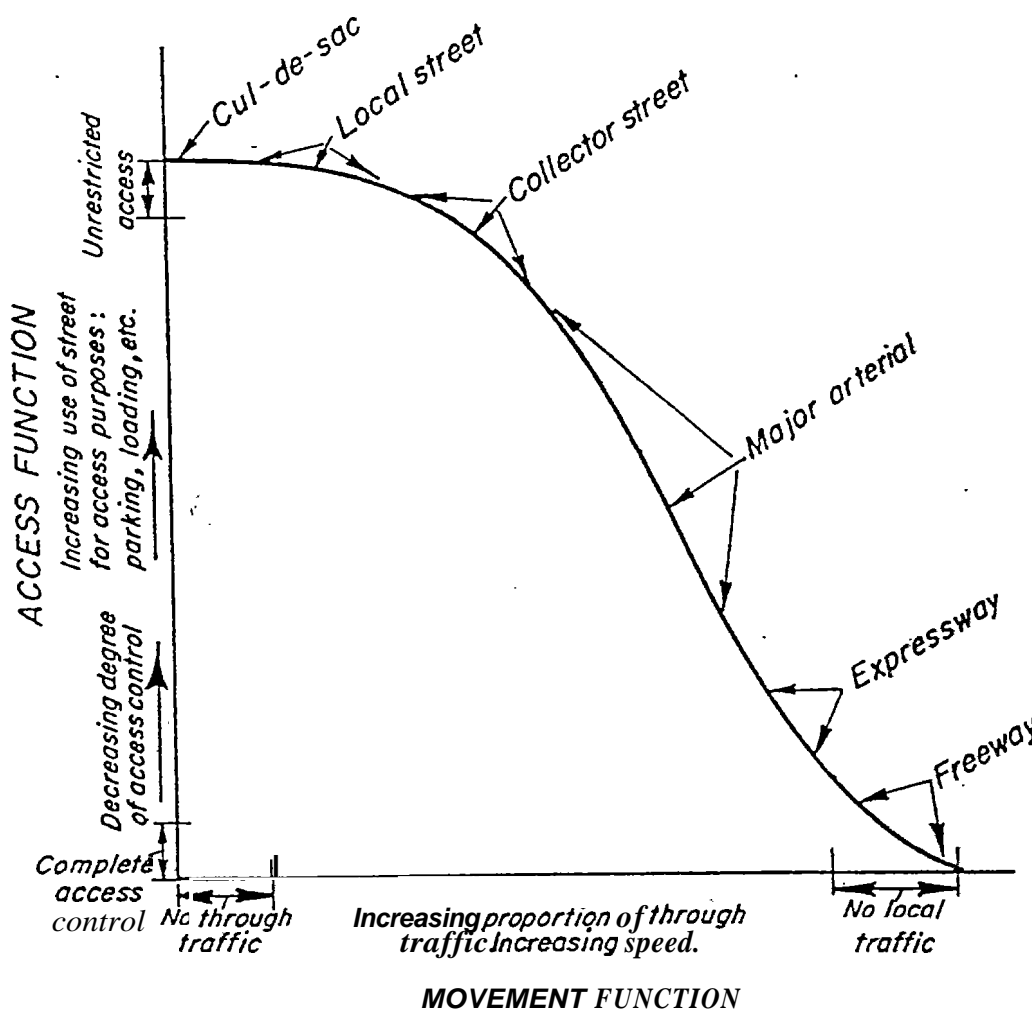
Goal 5, Policy 2: Develop neighborhood and local connections to provide adequate circulation in and out of the neighborhoods.

Goal 6, Policy 1: Designated arterial routes and freeway access areas in Beaverton are essential for efficient movement of goods; design these facilities and adjacent land uses to reflect the needs of goods movement.

FUNCTIONAL CLASSIFICATION

Roadways have two functions, to provide mobility and to provide access. From a design perspective, these functions *can* be incompatible since high or continuous speeds are desirable for mobility, while low speeds are more desirable for land access. Arterials emphasize a high level of mobility for through movement; local facilities emphasize the land access function; and collectors offer a balance of both functions (Figure 8-2).

Functional classification has commonly been mistaken as a determinate for traffic volume, road size, urban design, land use and various other features which collectively are the elements of a roadway, but not its function. For example, the traffic on a roadway can be more directly related to land uses and because a roadway carries a lot or a little traffic does not necessarily determine its function. The traffic volume, design (including access standards) and size of the roadway are outcomes of function, but do not define function.



Source: University of California,
'Fundamentals of Traffic Engineering'
Wolfgang S. Homburger and
James H. Kell

Figure 8-2
STREET FUNCTION RELATIONSHIP

Function can be best defined by connectivity. Without connectivity, neither mobility nor access can be served. Roadways that provide the greatest reach of connectivity are the highest level facilities. Arterials can be defined by regional level connectivity. These routes go beyond the city limits in providing connectivity and can be defined into two groups: principal arterials (typically state routes) and arterials. The movement of persons, goods and services depends on an efficient arterial system. Collectors can be defined by citywide or district wide connectivity. These routes **span** large areas of the city but typically do not extend significantly into adjacent jurisdictions. They are important to city circulation. The past text books on functional classification then define all other routes **as** local streets, providing the highest level of access to adjoining land uses. These routes do not connect at any significant level.

Recent work in the area of neighborhoods and their specific street needs provides a fourth level of functional classification- neighborhood route. In many past plans, agencies defined a minor collector or a neighborhood collector, however, use of the term collector is not appropriate. Collectors provide citywide or large district connectivity and circulation. There is a level between collector and local streets that is unique due to its level of connectivity. Local streets can be cul-de-sacs or short streets that do not connect to anything.¹ Neighborhood routes are commonly used by residents to circulate out of their neighborhood. They have connections within the neighborhood and between neighborhoods. These routes have neighborhood connectivity, but do not serve as citywide streets. They have been the most sensitive routes to through, speeding traffic due to their residential frontage. Because of their limited level of connectivity they can commonly be used as cut-through routes in lieu of congested or less direct arterials/collectors which are not performing adequately. Cut-through traffic **has** the highest propensity to speed, creating negative impacts on these neighborhood routes. By designating these routes, a more systematic, citywide program of neighborhood traffic management can be undertaken to protect these sensitive routes.

In the past, traffic volume and roadway size were linked to functional classification. More recently, urban design and land use have also been tied to functional class. Discussions of neo-traditional street grids that eliminate the need for functional class adds another commentary. This tends to become confusing, complicating **an** essential transportation planning exercise. The planning effort to identify connectivity of routes in Beaverton is essential to preserve and protect future mobility and access, by all modes of travel. In Beaverton, it is not possible to have citywide neo-traditional layout. Past land use decisions, topography and environmental features preclude this². Without defining the varying levels of connectivity now in the TSP, the future impact of the adopted Comprehensive Plan land uses will result in degraded ability to move goods and people (existing and new) in Beaverton, with an outcome of intolerable delays and order of magnitude greater costs to address solutions later

¹ Or in the case of neo-traditional grid systems, extensive redundancy in facilities results in local status to streets that have greater than local connectivity.

² While subdivisions or areas of neo-traditional development exist and are possible (even desirable), on the whole, the concept cannot be generically applied to **the** city in lieu of functional classification.

than sooner. By planning an effective functional classification of Beaverton streets³, the City can manage public facilities pragmatically and cost effectively.

These classifications do not mean that because a route is an arterial it is large and has lots of traffic. Nor do the definitions dictate that a local street should only be small with little traffic. Identification of connectivity does not dictate land use or demand for the facilities. The demand for streets is directly related to the land use. The highest level connected streets have the greatest potential for higher traffic volumes, but do not have to have high volumes as an outcome, depending upon land uses in the area. Typically, a significant reason for high traffic volumes on surface streets at any point can be related to the level of land use intensity within a mile or two. Many arterials with the highest level of connectivity have only 33 to 67 percent “through traffic”. Without the connectivity provided by arterials and collectors, the impact of traffic intruding into neighborhoods and local streets goes up substantially.

If land use is a primary determinate of traffic volumes on streets, then how is it established? In Oregon, land use planning laws require the designation of land uses in the Comprehensive Plan. Beaverton’s Comprehensive Plan land uses have been designated for over two decades. These land use designations are very important not only to the City for planning purposes, but to the people that own land in Beaverton. The adopted land uses in Beaverton have been used in this study, working with the Metro regional forecasts for growth in the region for the next 20 years. A regional effort, coordinated by Metro and local agencies, has been undertaken to allocate the determined overall land use in the most beneficial manner for transportation. Without this allocation, greater transportation impacts would occur (wider and more roads than identified in this plan). As discussed in Chapter 11, if the outcome of this TSP is either too many streets or solutions that are viewed to be too expensive, it is possible to reconsider the core assumptions regarding Beaverton’s livability - its adopted land uses or its service standards related to congestion. The charge of this TSP (as mandated by State law) is to develop the set of multi-modal transportation improvements to support the Comprehensive Plan land uses. Key to this planning task is the functional classification of streets.

Functional Classification Definitions

The proposed functional classification of streets in Beaverton is represented by Figure 8-3. Any street not designated as either an arterial, collector or neighborhood route is considered a local street.

Principal Arterials are typically freeways and state highways that provide the highest level of connectivity. These highways generally span several jurisdictions and many times have statewide importance (as defined in the ODOT Level of Importance categorization).⁴

³ Including definition of which routes connect through Beaverton, within Beaverton and which routes serve neighborhood and local level in the city.

⁴ *Oregon Highway Plan*, ODOT, 1991, Appendix A.

City of Beaverton Transportation System Plan

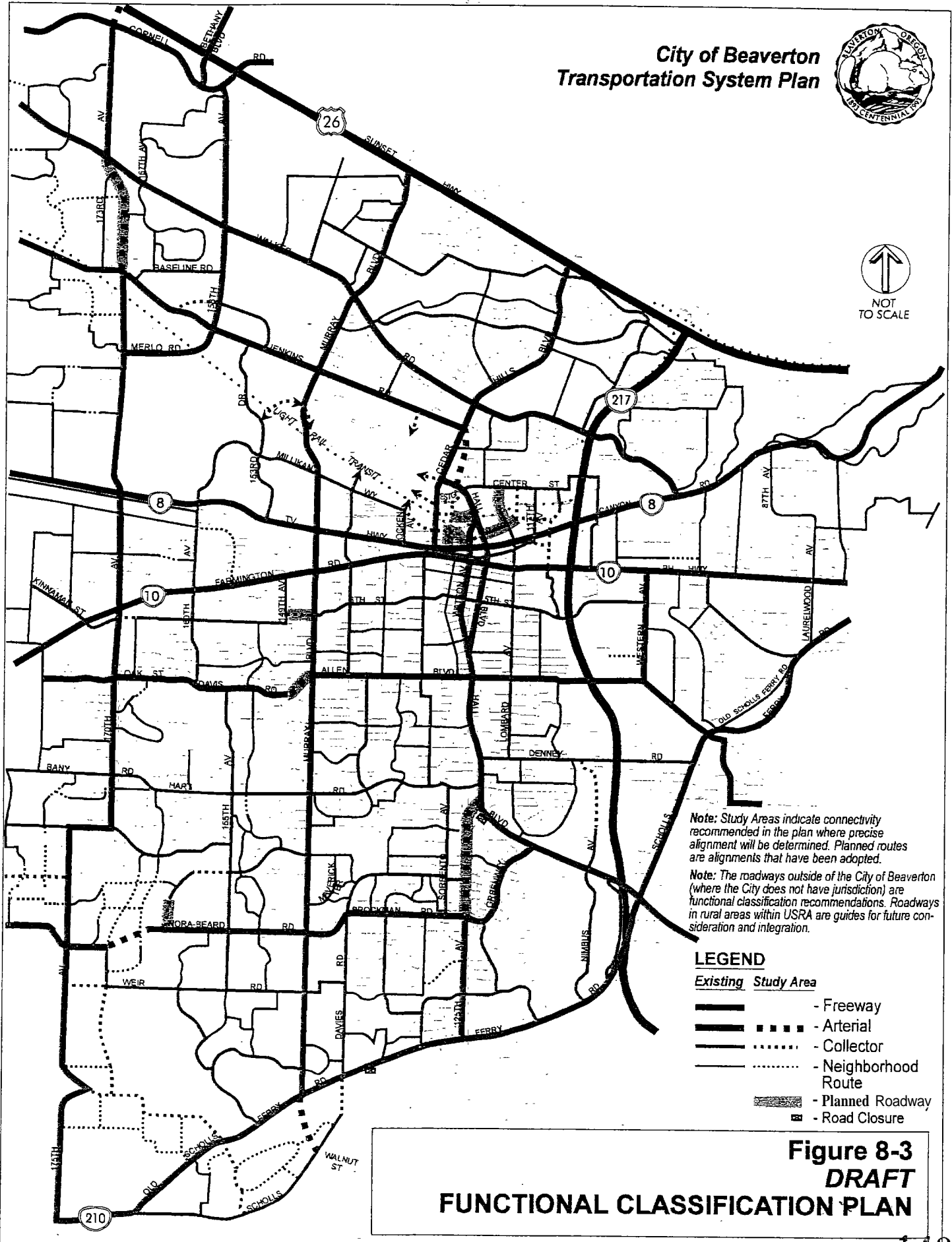


Figure 8-3
DRAFT
FUNCTIONAL CLASSIFICATION PLAN

Arterial streets serve to interconnect and support the principal arterial highway system. These streets link major commercial, residential, industrial and institutional areas. Arterial streets are typically spaced about one mile apart to assure accessibility and reduce the incidence of traffic using collectors or local streets in lieu of a well placed arterial street. Many of these routes connect to cities surrounding Beaverton.

Collector streets provide both access and circulation within residential and commercial/industrial areas. Collectors differ from arterials in that they provide more of a citywide circulation function, do not require **as** extensive control of access and penetrate residential neighborhoods, distributing trips from the neighborhood and local street system.

Neighborhood routes are usually long relative to local streets and provide connectivity to collectors or arterials. Because neighborhood routes have greater connectivity, they generally have more traffic than local streets and are used by residents in the area to get out of the neighborhood, but do not serve citywide/large area circulation. Traffic from cul-de-sacs and other local streets may drain onto neighborhood routes to gain access to collectors or arterials. Because traffic needs are greater than a local street, certain measures should be considered to retain the neighborhood character and livability of these routes. Measures such **as** neighborhood traffic management are often appropriate (including devices such **as** speed humps, traffic circles and other devices - refer to later section in this chapter). However, it should not be construed that neighborhood routes automatically get speed humps. While these routes have special needs, neighborhood traffic management is only one measure, not the only measure.

Local Streets have the sole function of providing access to immediate adjacent land. Service to “through traffic movement” on local streets is deliberately discouraged by design.

Functional Classification Changes

The proposed functional classification differs from the existing approved functional classification. Neighborhood routes were not defined in the existing functional classification. The prior system added major and minor classifications to arterials and collectors. These designations are removed since they define more of the design and demand (which are outcomes of function and land use) of a route, but not its function. The proposed functional classification was developed following detailed review of Beaverton’s, Washington County’s and Metro’s current proposal for functional classification. Table 8-1 summarizes the major differences between the proposed functional classification and the existing designations in Beaverton. This table also outlines the streets which were previously designated collectors that are now identified as neighborhood routes.

Criteria for Determining Changes to Functional Classification

The criteria used to assess connectivity has two components: the extent of connectivity (as defined above) and the frequency of the facility type. Maps *can* be used to determine regional, city/district and neighborhood connections. The frequency or need for facilities of certain classifications is not routine or easy to package into a single criteria. While planning textbooks call for arterial spacing of a mile, collector spacing of a quarter to a half mile, and neighborhood connections at an eighth to a sixteenth of

Table 8-1
Proposed Changes to Existing Roadway Classification

Roadway	Roadway Classification According to Jurisdiction		Proposed TSP Functional Classification
	City of Beaverton ⁵	Washington County ⁶	
Walker Road (Murray to Canyon)	Major Collector	Study area (Murray to 217) Major Collector (east of 217)	Arterial
170 th Avenue	Minor Arterial(Hart-Bany to Merlo) Major Collector (south of Bany & north of Merlo)	Minor Arterial (Rigert to Bseline)	Arterial
173 rd Avenue (north of Walker)	Major Collector"	Major Collector	Arterial
175 th Ave/Reusser (south of Rigert)	Maior Collector	Maior Collector	Arterial
Davis Road/Oak Street	Major Collector (170 th to Murray) Minor Collector (west of 170 th Ave)	Major Collector (170 th to Murray) Minor Collector (west of 170 th)	Arterial
Nora-Beard Road (west of Murray)	Major Collector	Major Collector	Arterial
Murray Boulevard (south of Old Scholls Ferry)	Maior Collector	Collector	Arterial
153 rd Drive	Minor Arterial	Minor Arterial	Collector
Millikan Way	Minor Arterial	Minor Arterial	Collector
Denney Road	Minor Arterial	Minor Arterial	Collector
Nimbus Avenue	Minor Arterial	Minor Arterial	Collector
141 st Avenue (Allen to Farmington)	Minor Collector	Minor Collector	Collector

⁵ ~~City~~ of Beaverton Functional Classification Plan, Street Standard Map, adopted November 28, 1988.

⁶ Washington County Transportation Plan Comprehensive Plan **Volume XV**, October 1988.

Table 8-1 (Continued)
Proposed Changes to Existing Roadway Classification

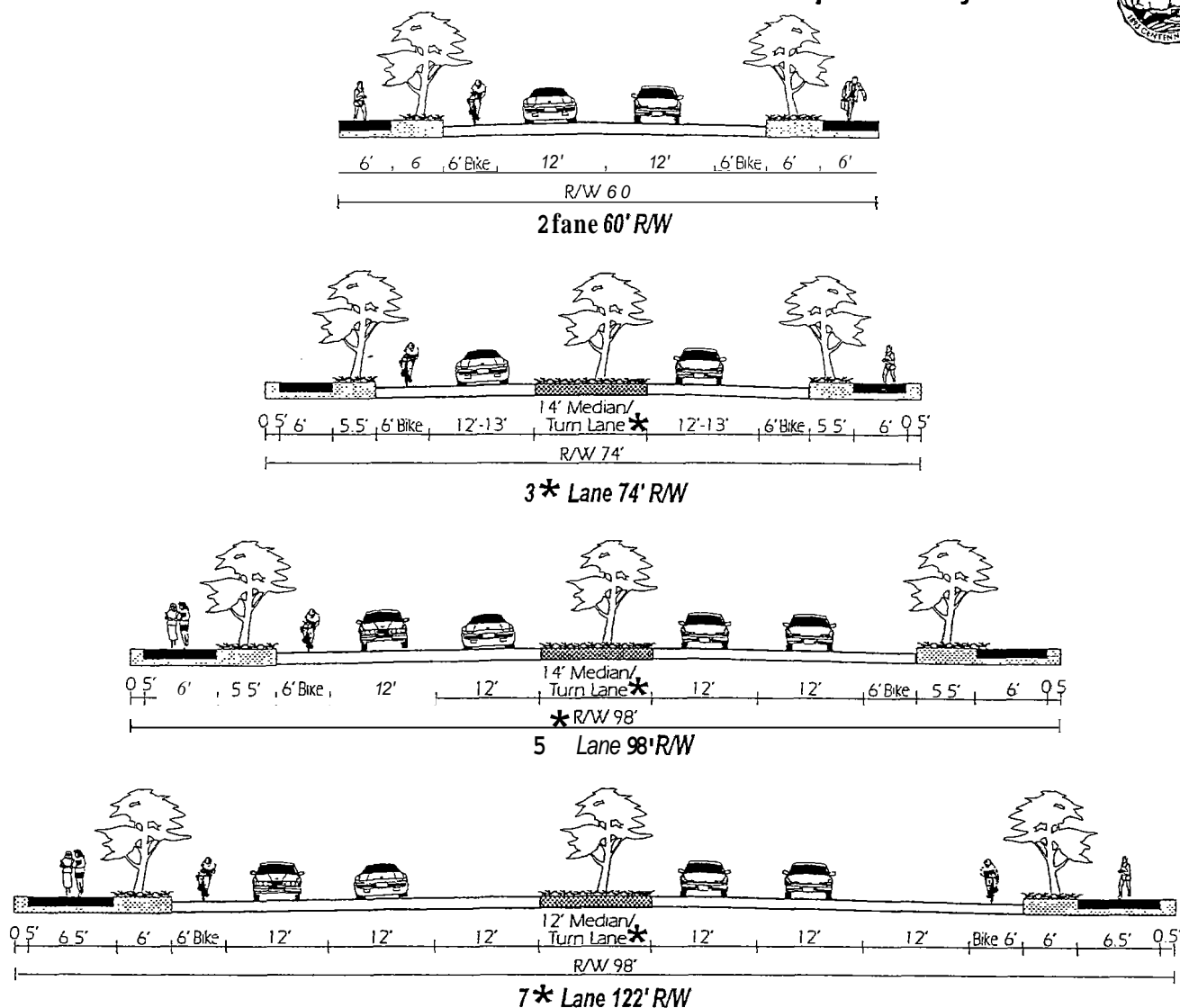
Changes from Collector designation to Neighborhood Route

2nd Street	Alger	Main Avenue
22nd/Whistling	Bel Aire/Hillcrest/Anne	Maverick Terrace
78th Avenue	Berkshire	Mayfield
87th Avenue	Blanton/156th	Old Scholls at Elm
91st Avenue	Canvon Lane	Rita/130th
96th Avenue	Cresmoor/Clifford	Shaw
107th Avenue	Davies e/o 135th	Teal/Otter/136th/Cottontail
149th Avenue (s/o OR10)	Ecole	Turquoise/Emerald
150th/Pioneer/Meadow	Elm/Pinehurst	Village Lane
151st Avenue	Furlong/Devonshire/Foothill	Wier/130th
152nd Avenue	Huntington	Wilshire/Gardenview
155th - Weir-160th	Hvland Way/Valley Avenue	Wilson s/o Hart
160th/Galena	King	
165th Avenue	Linda/Todd/Devonwood	
173rd (s/o Shady Fir)		

a mile, this does not form the only basis for defining functional classification. Changes in land use, environmental issues or barriers, topographic constraints, and demand for facilities can change the frequency, for routes of certain functional classifications- While spacing standards **can** be a guide, they must consider other features and potential long term uses **in** the area (some areas would not experience significant changes in demand, where others will). Linkages to regional centers, town centers and station **areas** are another consideration for addressing frequency of routes of certain functional class. For example, connectivity to these areas are important, where **as** linkages that do not connect any of these areas could be classified **as** lower levels in the functional classification.

Characteristics of Streets for each Functional Classification

The design characteristics of streets in Beaverton were developed to meet the function and demand for each facility **type**. Because the actual design of roadway **can** vary from segment to segment due to adjacent land uses and demands, the objective was to define a system that allows standardization of key characteristics to provide consistency, but also to provide criteria for application that provides some flexibility, while meeting standards. Figures 8-4 to 8-7 depict sample street cross-sections and design criteria for arterials, collectors, neighborhood routes and local streets. Table 8-2 provides a summary of the key street characteristics and how they can be applied on a case by case basis. While these are not entirely consistent with the Metro urban design designations of streets, they provide the best match for the specific needs of Beaverton.



List

- 125th Avenue
- 158th/Merlo
- 170th/173rd/175th
- Murray Boulevard
- Cedar Hills Boulevard
- Hall/Watson
- Western Avenue
- Cornell Road
- Walker Road
- Jenkins/Baseline
- Canyon/TV Highway
- Farmington/BH Highway
- Allen/Davies/Oak
- Greenway/Brockman/Beard/Nora
- Scholls Ferry Road

Notes:

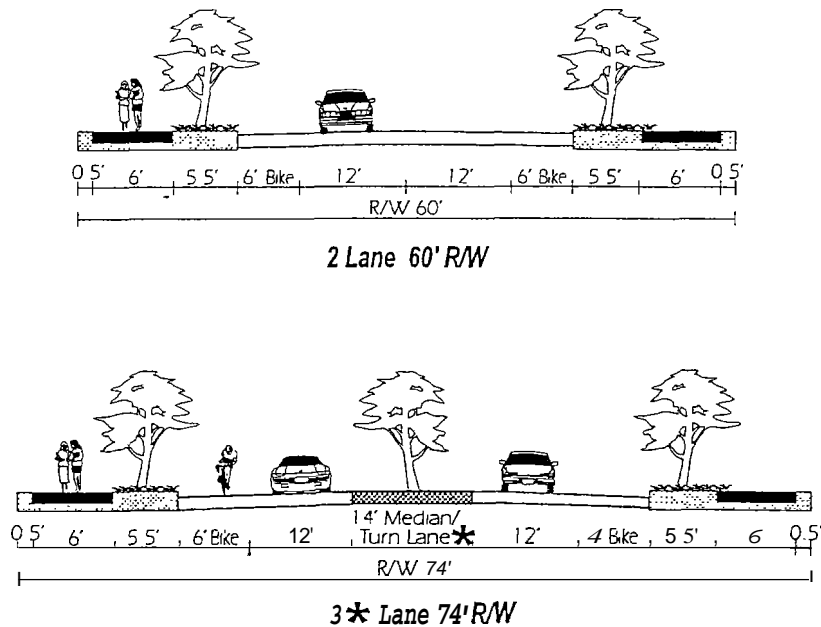
1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with TVFR).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes plus minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
6. Typically 6" is provided from R/W line to edge of concrete surface (for maintenance/utilities).

* Note that, where appropriate, the median/lane may not be provided resulting in 2, 4 and 6 lane cross sections. The removal of the center turn lane must consider both safety and pedestrian needs.

Criteria

Vehicle Lane Widths: (minimum widths)	Truck Route = 12 ft. Bus Route = 72 ft. 11 ft. (12 A Preferred)
Bicycle Lanes: (minimum widths)	New Construction = 6 ft. Reconstruction = 5 to 6 ft.
Sidewalks: (minimum width)	6-8 ft. Consider Curb Extensions on Ped Routes
Landscape Strips:	Preferred
Medians:	5/7 Lane = Required 3 Lane = Optional
Neighborhood Traffic Management:	Only under special conditions where route extends 1 to 2 miles or more through residential frontage

**Figure 8-4
ARTERIAL
SAMPLE STREET CROSS SECTIONS**



List

- | | | | |
|------------------|-------------------------|------------------------|-------------------------|
| - Baseline Road | - 153rd Drive | - Henry Street | - Sexton Mountain Drive |
| - Jay Street | - 155th Avenue | - Lombard Avenue | - Davies Road |
| - Downing Street | - 160th Avenue | - Broadway | - Nimbus Avenue |
| - Butner Road | - Millikan Way | - Griffith Drive/114th | - Teal Boulevard |
| - Parkway | - Kinnaman Street | - Jamieson Road | - Scholis Ferry Road |
| - Marlow/Roxbury | - Division Street | - Bany/Hart/Denney | - Weir Road |
| - 5th/6th Street | - Erickson Avenue/130th | - Wilson Avenue | - Cascade Avenue |
| - 117th Avenue | - Hocken Avenue | - Sorrento Avenue | - Conesfoga Drive |
| - 141st Avenue | - Center/Cabot/110th | - Rigert Road | - Downing Drive |
| | | | - Haystack/135th |

Notes:

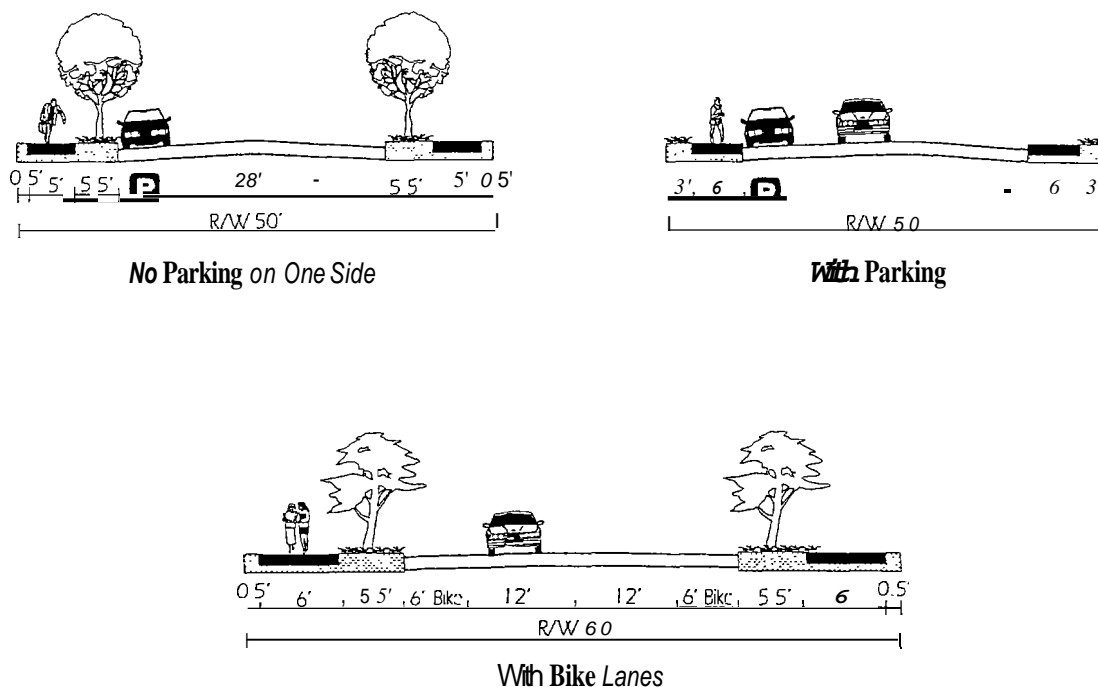
- Space between curb and median minimum 19' with mountable curb design (to be coordinated with TVFR).
- Selection of placement of sidewalk and planter specific to application. Cmss sections show two choices for reference.
- Width of curb is included in sidewalk or planter strip width when adjacent to street
- Samples show the desirable applications given number of lanes plus minimum standards can be applied case by case.
- Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
- Typically 6" is provided from R/W line to edge of concrete surface (for maintenance/utilities).
- Encourage use of curb extensions at intersections in commercial areas and on any pedestrian routes.
- For constrained settings, a three lane cross section can be developed in 44 feet (5 ft. bike lanes, 11 ft. travel lane, 12 ft. turn lane/median)

Criteria

Vehicle Lane Widths: (minimum)	11 ft. Preferred
On Street Parking:	Residential 6 to 8 ft. Commercial
Bicycle Lanes: (minimum widths)	New Construction = 6 ft. Reconstruction = 5 to 6 ft.
Sidewalks: (minimum width)	5 to 7 ft.
Landscape Strips:	Preferred
Medians:	3-Lane = Optional
Neighborhood Traffic Management:	Underspecial conditions

* Note that, where appropriate, the median/lane may not be provided resulting in 2, 4 and 6 lane cross sections. The removal of the center turn lane must consider both safety and pedestrian needs.

Figure 8-5
COLLECTOR
SAMPLE STREET CROSS SECTIONS



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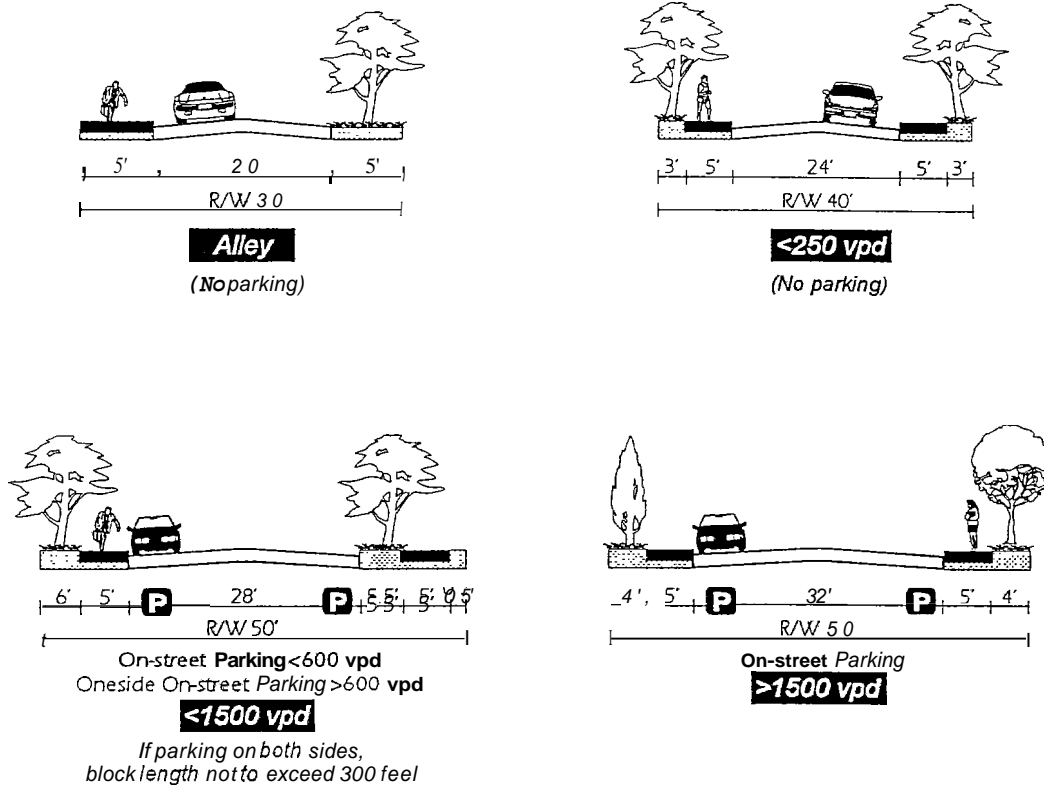
1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with TVFR).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes plus minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.
6. Typically 6" is provided from R/W line to edge of concrete surface (for maintenance/utilities).
7. These are guidelines for future neighborhood route development and does not require changes/conversion to existing streets.

Criteria

Vehicle Lane Widths: (minimum widths)	10 ft.
On-Street Parking	6 to 8 ft.
Curb Extensions for Pedestrians:	Consider on Pedestrian Routes
Sidewalks: (minimum width)	5 ft.
Landscape Strips:	Preferred
Neighborhood Traffic Management:	Appropriate when Warranted

P - On-street Parking

Figure 8-6
NEIGHBORHOOD
SAMPLE STREET CROSS SECTIONS



Notes:

1. Space between curb and median minimum 19' with mountable curb design (to be coordinated with TVFR).
2. Selection of placement of sidewalk and planter specific to application. Cross sections show two choices for reference.
3. Width of curb is included in sidewalk or planter strip width when adjacent to street.
4. Samples show the desirable applications given number of lanes plus minimum standards can be applied case by case.
5. Actual width of street and sidewalk area can be adjusted within R/W based on modal priorities and adjacent land use.

Criteria

Vehicle Lane Widths: (minimum widths)	9 to 10 ft.
On-Street Parking	6 to 7 ft.
Sidewalks: (minimum width)	5 ft.
Landscape Strips:	Preferred
Neighborhood Traffic Management:	Should not be necessary (under special conditions)

P - On-street parking

<1500 vpd - Guide for Traffic Volume Per Day
(does not require conversion of
existing routes)

Figure 8-7
LOCAL STREET RESIDENTIAL
SAMPLE STREET CROSS SECTIONS

Table 8-2
Proposed Street Characteristics

Vehicle Lane Widths: (minimum widths)	Truck Route = 12 feet Bus Route = 11 feet Arterial = 12 feet Collector = 11 feet Neighborhood = 10 feet Local = 9 ⁷ to 10 feet Turn Lane = 10 feet ⁸
On-Street Parking:	Residential = 6 to 8 feet Commercial = 7 to 8 feet
Bicycle Lanes: (minimum widths)	New Construction = 6 feet Reconstruction = 5 to 6 feet
Curb Extensions for Pedestrians:	Consider on any Pedestrian Master Plan Route
Sidewalks: (minimum width)	Local = 5 feet ⁹ Neighborhood = 5 feet ¹⁰ Collector = 6 to 8 ¹⁰ feet Arterial = 6 to 10 ¹⁰ feet
Landscape Strips:	Residential/Neighborhood = Optional Collector/Arterial = Desirable
Medians:	5-Lane = Required 3-Lane = Optional
Neighborhood Traffic Management:	Local = Should not be necessary Neighborhood = Should Consider Collectors = Under Special Conditions Arterials = Only under Special Conditions
Transit:	Arterial/collectors = Appropriate Neighborhood = Only in special circumstances
Turn Lanes:	When Warranted ¹¹
Access Control:	Goal 3, Policy 8

⁷ 9 foot lanes would only be used in conjunction with on-street parking.

⁸ Desirable 12 feet for arterial streets and truck routes.

⁹ 5 foot with landscape strip, 6 foot against curb.

¹⁰ Larger sidewalks than minimums should be considered for areas with significant pedestrian volumes. Commercial areas where pedestrian flows of over 100 pedestrians an hour are present or forecast, specific analysis should be conducted to size sidewalks appropriately for safe movement.

¹¹ Turn lane warrants should be reviewed using Highway Research Record, No. 211, NCHRP Report No. 279 or other updated/superseding reference.

The analysis of capacity and circulation needs for Beaverton outlines several roadway cross sections. The most common are 2, 3 and 5 lanes wide. Where center left turn lanes are identified (3, 5 and 7 lane sections), the actual design of the street may include sections without center turn lanes (2, 4 and 6 lanes sections) or with median treatments, where feasible. The actual treatment will be determined within the design and public process for implementation of each project. The plan outlines requirements which will be used in establishing right-of-way needs for the development review process. The right-of-way (ROW) requirements for arterial, collector and neighborhood routes are 60 feet for the two lane streets (special consideration for 50 foot or narrower ROW will be made for local streets), 74 feet for three lane streets, 98 feet for five lane streets and 122 feet for seven lane streets.

Wherever arterial or collectors cross themselves, planning for additional right-of-way to accommodate turn lanes should be considered within 500 feet of the intersection. Figure 8-8 summarizes the Beaverton streets which are anticipated within the TSP planning horizon to require right-of-way for more than two lanes. The planning level right-of-way needs can be determined utilizing Figure 8-8, Table 8-2 and the lane geometry sketches in the technical appendix. Specific right-of-way needs will need to be monitored continuously through the development review process to reflect current needs and conditions (that is to say that more specific detail may become evident in development review which requires other improvements than outlined in this 20 year general planning assessment of street needs).

These cross sections are provided for guiding discussions that will update the City of Beaverton Engineering Design Manual. There is an on-going discussion at a regional level regarding street cross sections. Many of the major streets in Beaverton are maintained and operated by Washington County or ODOT. Metro has designated Regional Street Design in their draft of the RTP¹². The City of Beaverton will need to coordinate with the regional agencies to assure consistency in cross section planning as the County Transportation Plan and the Metro Regional Transportation Plan move forward.

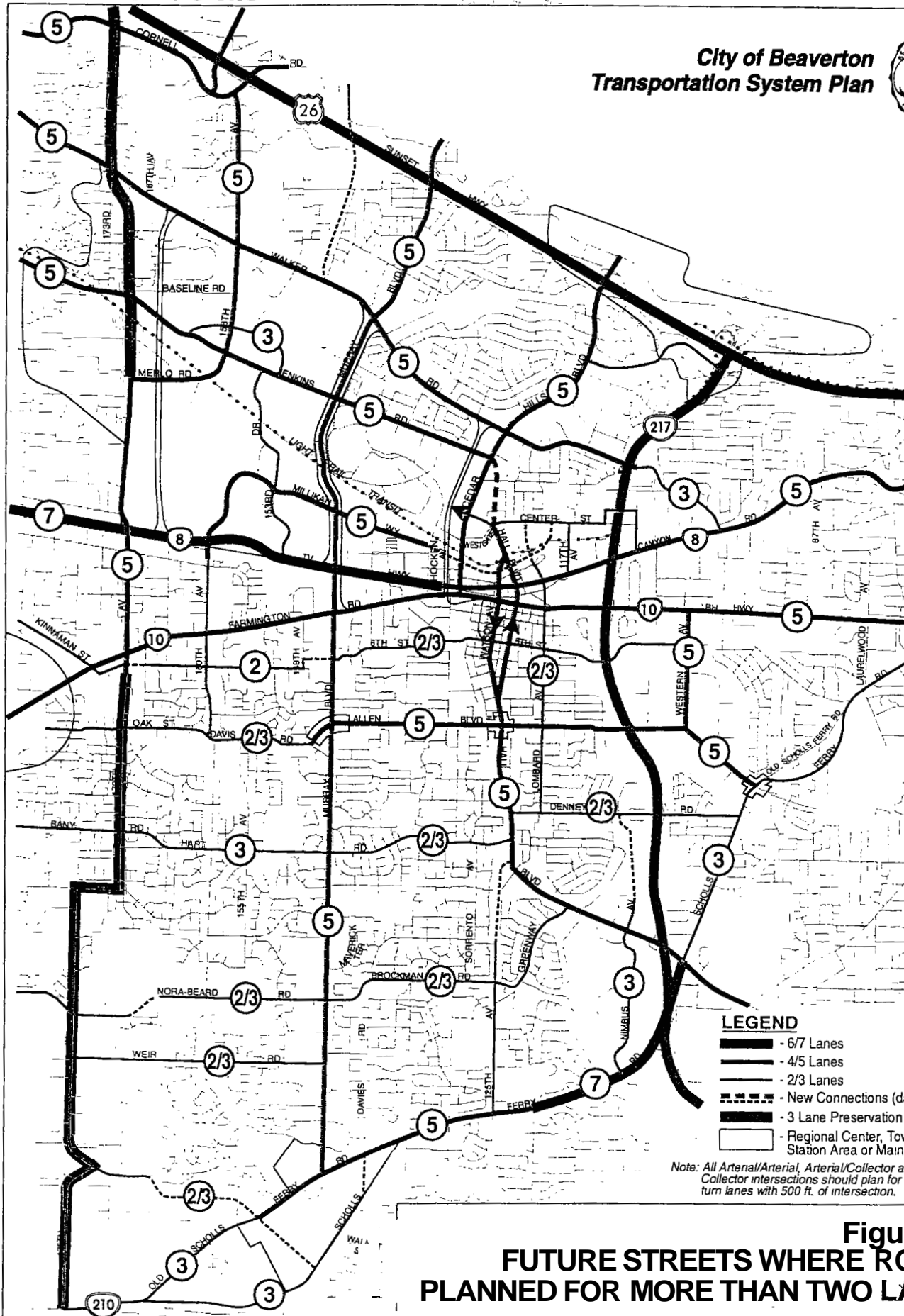
Connectivity/Local Street Plan

There are a number of locations in Beaverton where, due to the lack of connection points, a majority of neighborhood traffic is funneled onto one single street. This type of street network results in out-of-direction travel for motorists and an imbalance of traffic volumes that impacts residential frontage. By providing connectivity between neighborhoods, out-of-direction travel and vehicle miles traveled (VMT) can be reduced, accessibility between various modes can be enhanced and traffic levels can be balanced out between various streets. Various goals and policies established by this TSP are intended to accomplish these objectives.

In Beaverton, some of these local connections can contribute with other street improvements to mitigate capacity deficiencies by better dispersing traffic. For example, the areas adjacent to 170th and 185th Avenues are benefited by improved connectivity.

¹² *Regional Street Design, RTP and 2040 planning, Metro, Draft 3.0, July 1, 1997.*

**City of Beaverton
Transportation System Plan**



**Figure 8-8
FUTURE STREETS WHERE ROW IS
PLANNED FOR MORE THAN TWO LANES**

Several roadway connections will be needed within neighborhood areas to reduce out of direction travel for vehicles, pedestrians and bicyclists. The proposed Functional Classification map (Figure 8-3) shows several neighborhood routes through currently undeveloped areas to indicate desired connection points and access points to arterial or collector roadways. In most cases, the alignments **are** not specific and these connections are aimed at reducing potential neighborhood traffic impacts by better balancing traffic flows on neighborhood routes. These local connections shown on Figures 8-9 to 8-20 (representing the City of Beaverton neighborhood districts) are specified **as** bicycle and pedestrian **only** connections or **as** multi-modal connections (including autos). The arrows shown in the figures represent potential connections and the general direction for the placement of the connection. In each case; the specific alignments and design will be better determined upon development review. The criteria used for providing connections follow:

- Every **300** to 500 foot grid for pedestrians and bicycles
- Every 1,000 foot grid for automobiles

To protect existing neighborhoods from potential traffic impacts of extending stub end streets, connector roadways should incorporate neighborhood traffic management into their design and construction. Neighborhood traffic management is described later in this chapter.

The arrows shown on the local connectivity figures indicate priority connections only. Other stub end streets in the City's road network may become cul-de-sacs, extended cul-de-sacs or provide local connections. Connections from these stub end streets could be deemed appropriate and beneficial to the public, **as** future development occurs. The goal would continue to be improved city connectivity for all modes of transportation.

CIRCULATION AND CAPACITY NEEDS

The capacity and circulation needs in Beaverton were determined for existing and future conditions. The process used for analysis is outlined below, followed by the findings and recommendations. The extent **and** nature of the street improvements for Beaverton **are** significant. This section outlines the **type** of improvements that would be necessary **as** part of a long range master plan. Phasing of implementation will be necessary since all the improvements cannot be done at once. This will require prioritization of projects and periodic updating to reflect current needs. Most importantly, it should be understood that the improvements outlined in the following section are a guide to managing growth in Beaverton, framing up the types of right-of-way and street needs that will be required as development occurs.

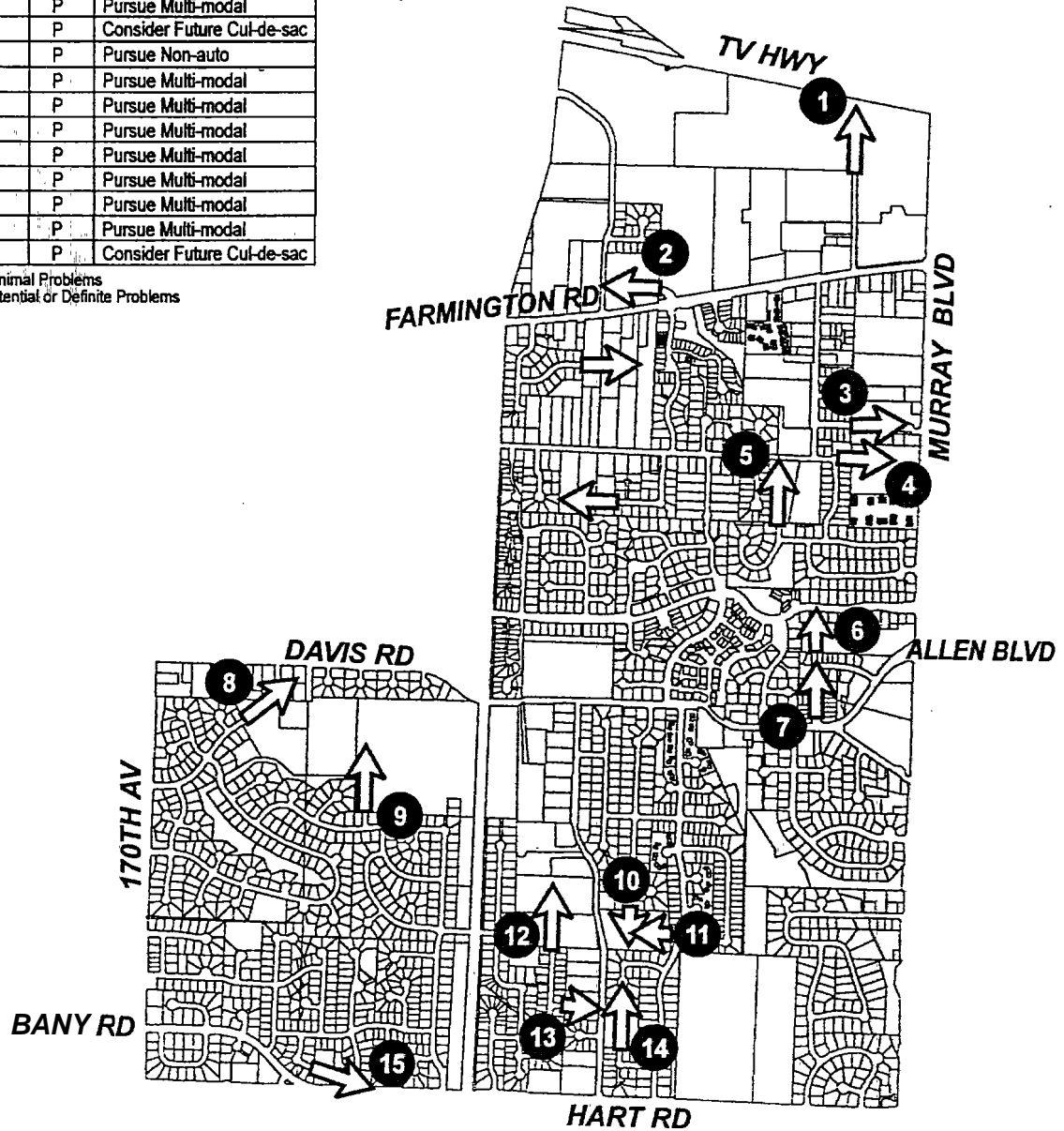
Approach

Existing needs were identified in Chapter 3. Future capacity needs were developed using a detailed travel demand forecast tool, built off the Metro regional travel demand model. This detailed model more accurately reflects access and land use in Beaverton than the regional travel demand model. Evening peak hour traffic volumes were forecast for the future (year 2015) scenario for the Beaverton



Location	Rating	Recommendation
1	P	Feasibility Constraints
2	M	Pursue Multi-modal
3	P	Pursue Multi-modal
4	P	Feasibility Constraints
5	P	Pursue Multi-modal
6	P	Consider Future Cul-de-sac
7	P	Pursue Non-auto
8	P	Pursue Multi-modal
9	P	Pursue Multi-modal
10	P	Pursue Multi-modal
11	P	Pursue Multi-modal
12	P	Pursue Multi-modal
13	P	Pursue Multi-modal
14	P	Pursue Multi-modal
15	P	Consider Future Cul-de-sac

M = Minimal Problems
P = Potential or Definite Problems



LEGEND

← - Potential Connection

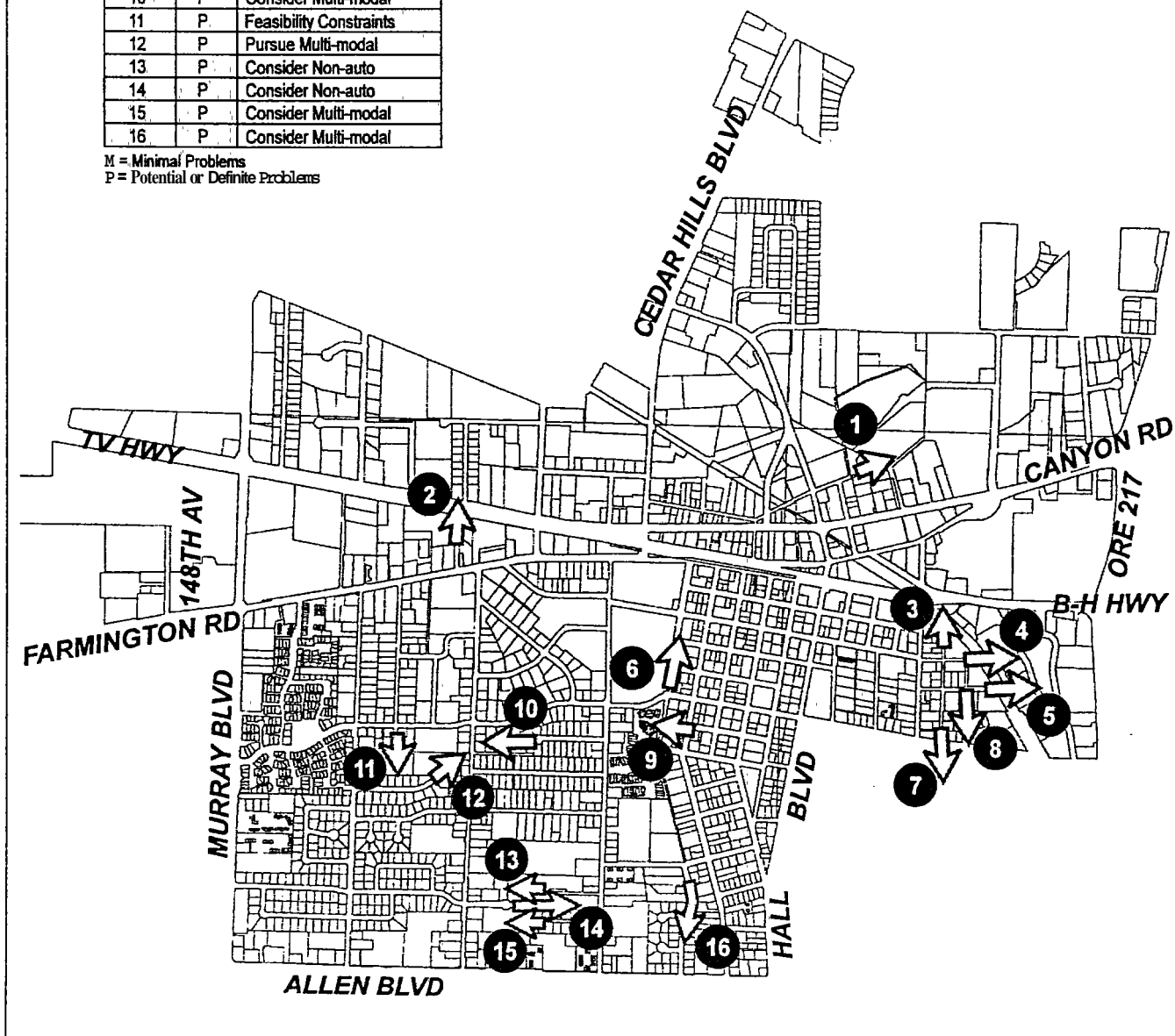
00 - Street Stub Identification Number

Figure 8-10
LOCAL STREET CONNECTIVITY
West Beaverton



Location	Rating	Recommendation
1	P	Pursue Multi-modal
2	P	Feasibility Constraints
3	P	Consider Non-auto
4	P	Feasibility Constraints
5	P	Feasibility Constraints
6	P	Pursue Non-auto
7	P	Feasibility Constraints
8	P	Consider Multi-modal
9	P	Consider Multi-modal
10	P	Consider Multi-modal
11	P	Feasibility Constraints
12	P	Pursue Multi-modal
13	P	Consider Non-auto
14	P	Consider Non-auto
15	P	Consider Multi-modal
16	P	Consider Multi-modal

M = Minimal Problems
P = Potential or Definite Problems



LEGEND



- Potential Connection

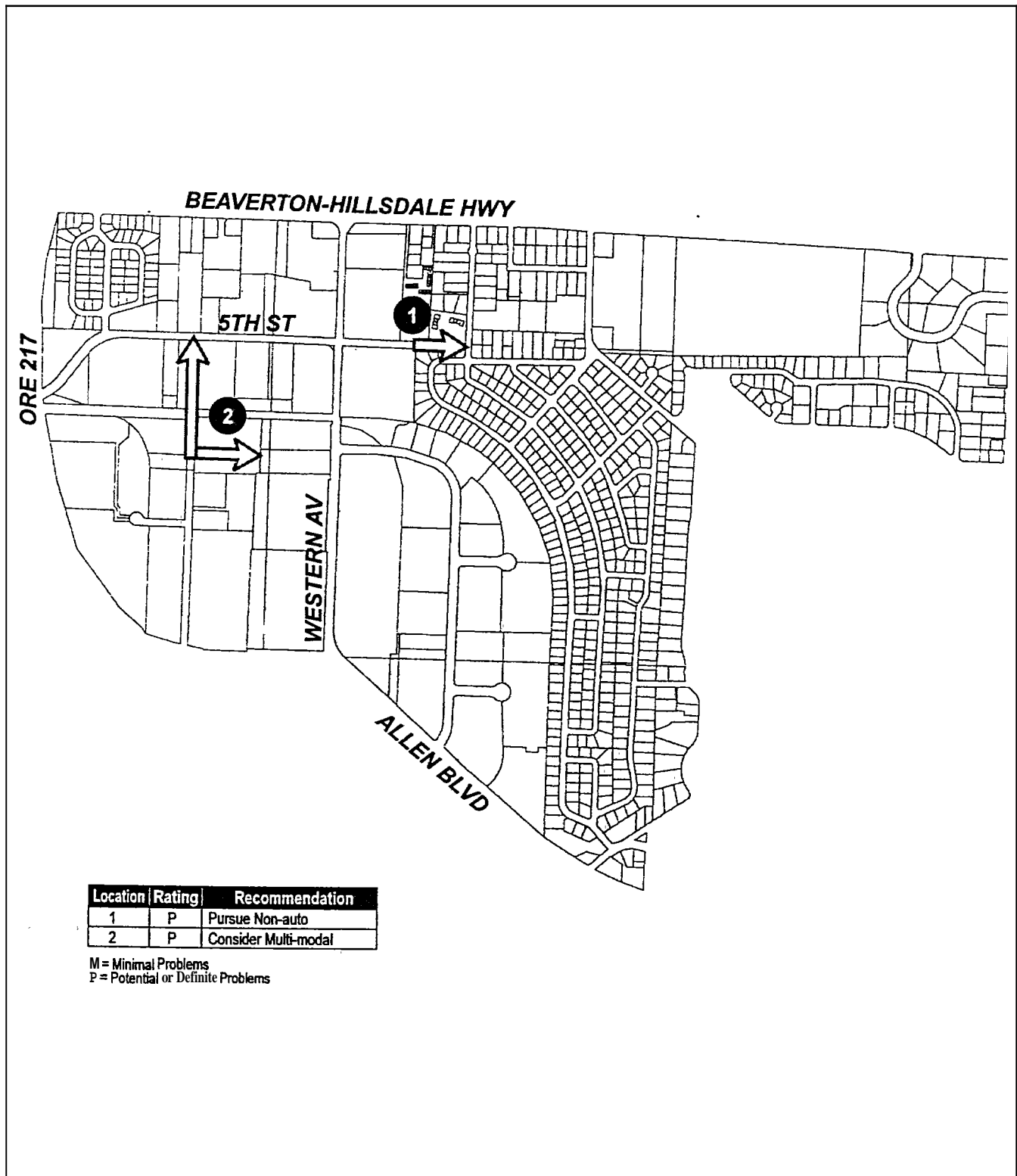


- Street Stub Identification Number

Figure 8-31
LOCAL STREET CONNECTIVITY
Central Beaverton



TO SCALE



LEGEND



- Potential Connection

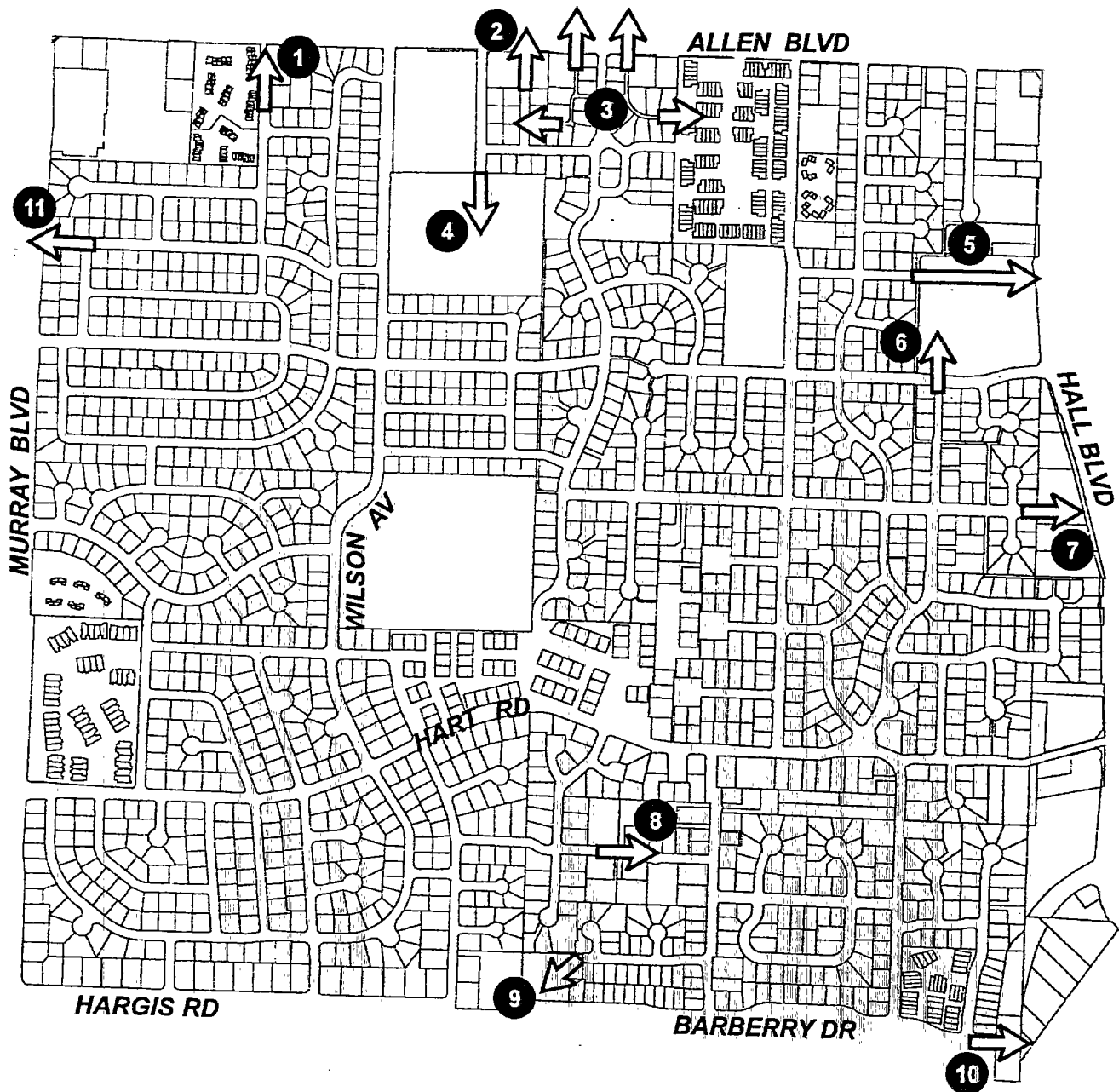


- Street Stub Identification Number

Figure 8-12
LOCAL STREET CONNECTIVITY
Raleigh West



TO SCALE



Location	Rating	Recommendation
1	P	Pursue Multi-modal
2	P	Feasibility Constraints
3	P	Consider Non-auto
4	P	Consider Non-auto
5	M	Pursue Multi-modal
6	M	Consider Multi-modal

Location	Rating	Recommendation
7	M	Feasibility Constraints
8	P	Pursue Non-auto
9	P	Pursue Multi-modal
10	P	Pursue Multi-modal
11	P	Pursue Multi-modal

M = Minimal Problems
P = Potential or Definite Problems

LEGEND

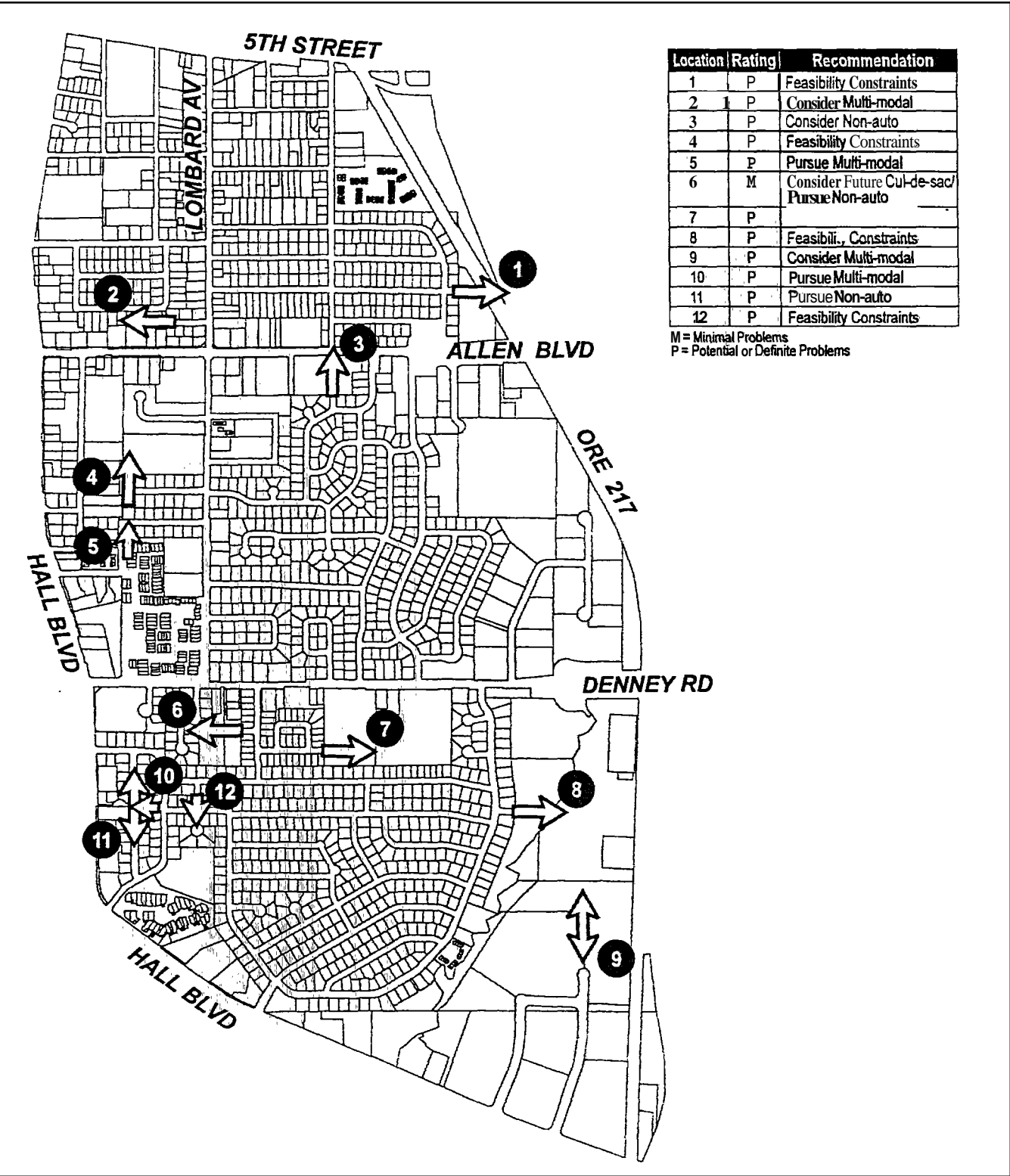


- Potential Connection



- Street Stub identification Number

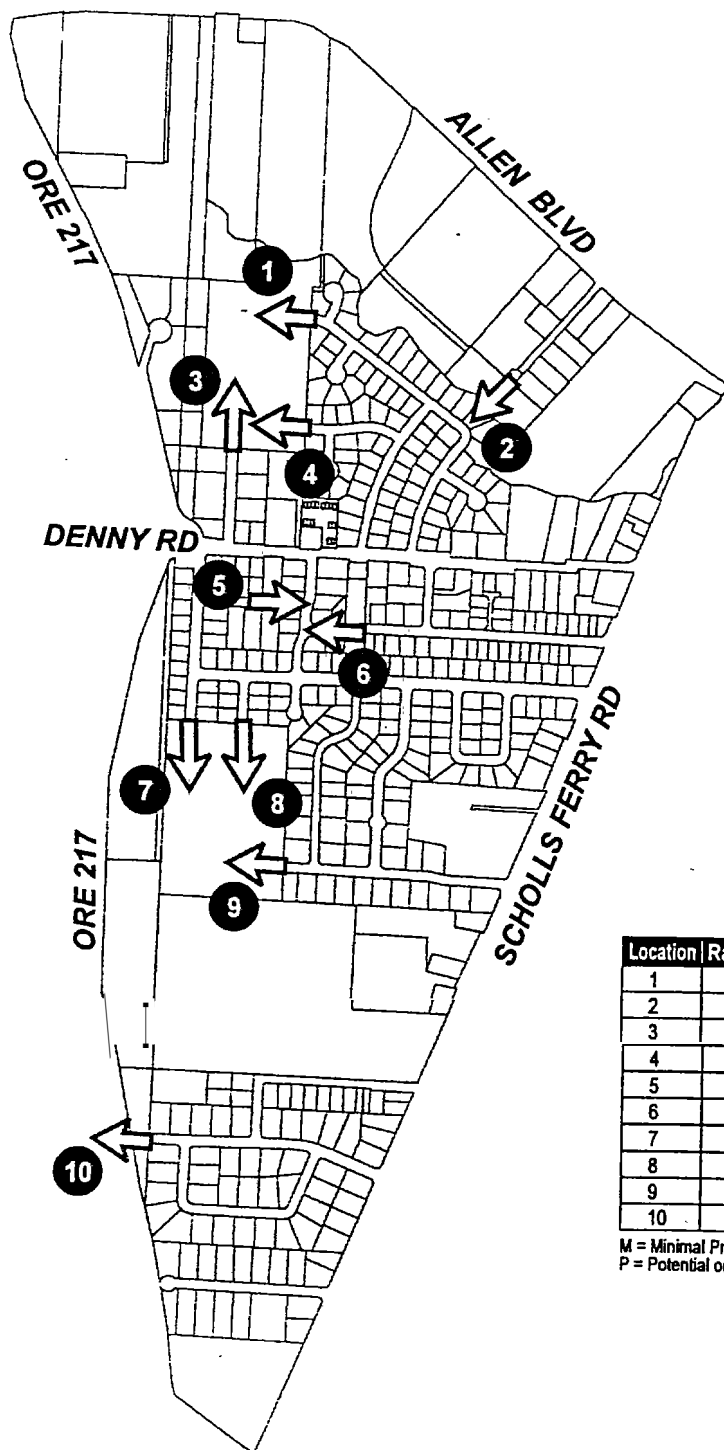
Figure 8-13
LOCAL STREET CONNECTIVITY
Highland



LEGEND

- Potential Connection
- Street Stub Identification Number

Figure 8-14
LOCAL STREET CONNECTIVITY
Yose

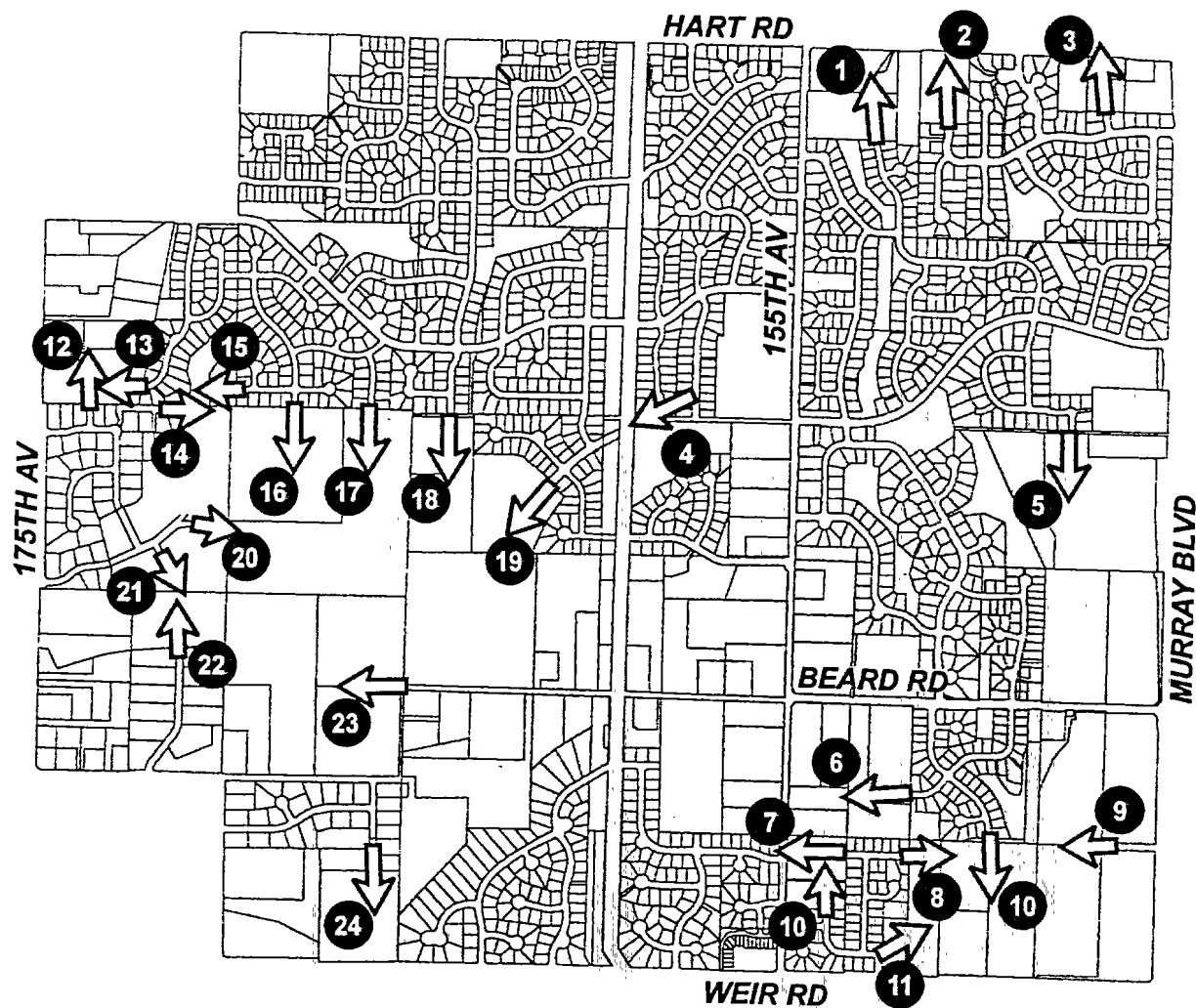


Location	Rating	Recommendation
1	P	Consider Non-auto
2	P	Feasibility Constraints
3	P	Consider Non-auto
4	P	Feasibility Constraints
5	P	Feasibility Constraints
6	M	Consider Multi-modal
7	P	Consider Non-auto
8	P	Consider Non-auto
9	P	Consider Non-auto
10	P	Consider Multi-modal

M = Minimal Problems
P = Potential or Definite Problems

LEGEND
↔ - potential Connection
00 - Street Stub Identification Number

Figure 8-15
LOCAL STREET CONNECTIVITY
Denney/Whitford



Location	Rating	Recommendation
1	P	Pursue Multi-modal
2	M	Pursue Multi-modal
3	P	Consider Multi-modal
4	M	Pursue Multi-modal
5	P	Pursue Multi-modal
6	P	Pursue Multi-modal
7	P	Pursue Multi-modal
8	P	Pursue Multi-modal
9	P	Pursue Multi-modal
10	P	Pursue Multi-modal
11	P	Pursue Multi-modal
12	P	Pursue Multi-modal

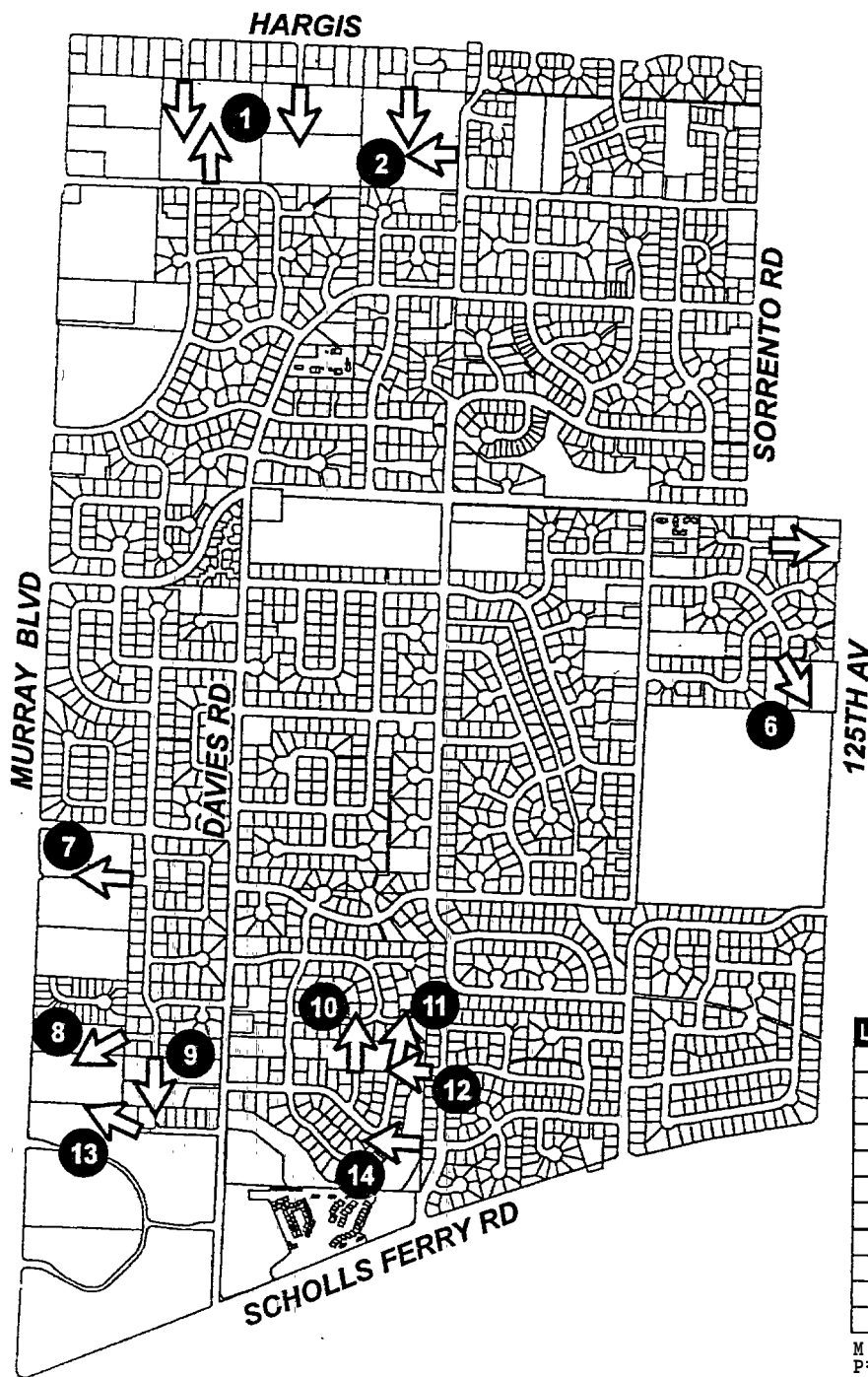
Location	Rating	Recommendation
13	P	Pursue Multi-modal
14	M	Pursue Multi-modal
15	P	Pursue Multi-modal
16	M	Pursue Multi-modal
17	P	Pursue Multi-modal
18	P	Pursue Multi-modal
19	P	Pursue Multi-modal
20	P	Pursue Multi-modal
21	P	Pursue Multi-modal
22	P	Pursue Multi-modal
23	P	Pursue Multi-modal
24	P	Pursue Multi-modal

M = Minimal Problems
P = Potential or Definite Problems

LEGEND

- Potential Connection
- Street Stub Identification Number

Figure 8-16
LOCAL STREET CONNECTIVITY
Sexton Mountain



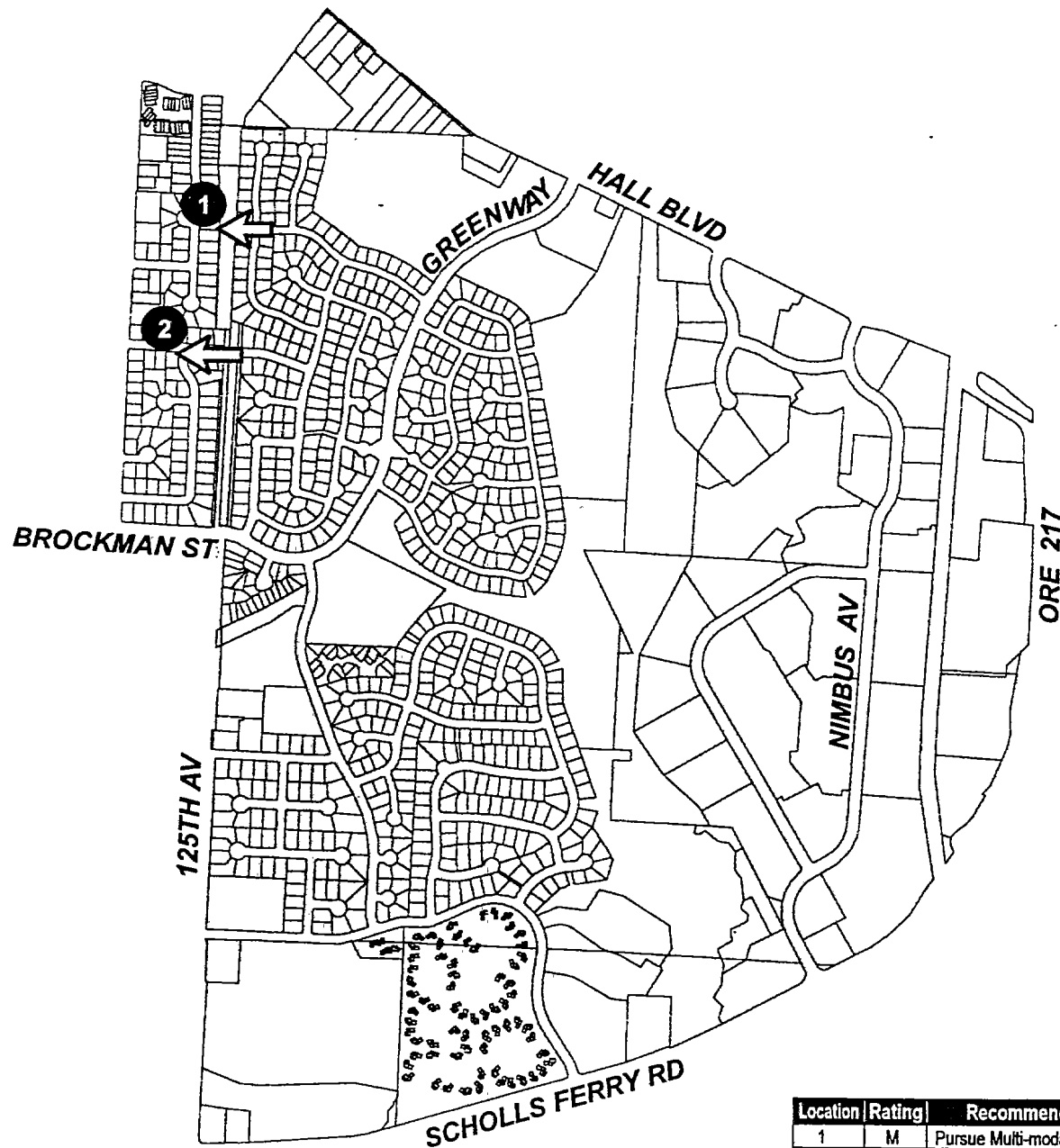
Location	Rating	Recommendation
1	P	Pursue Non-auto
2	P	Pursue Non-auto
6	P	Pursue Multi-modal
7	P	Pursue Multi-modal
8	P	Pursue Multi-modal
9	P	Pursue Multi-modal
10	P	Consider Future Cul-de-sac
11	P	Consider Future Cul-de-sac
12	P	Pursue Non-auto
13	P	Pursue Multi-modal
14	P	Pursue Non-auto

M = Minimal Problems
P = Potential or Definite Problems

LEGEND

- Potential Connection
- Street Stub Identification Number

Figure 8-17
LOCAL STREET CONNECTIVITY
South B averton



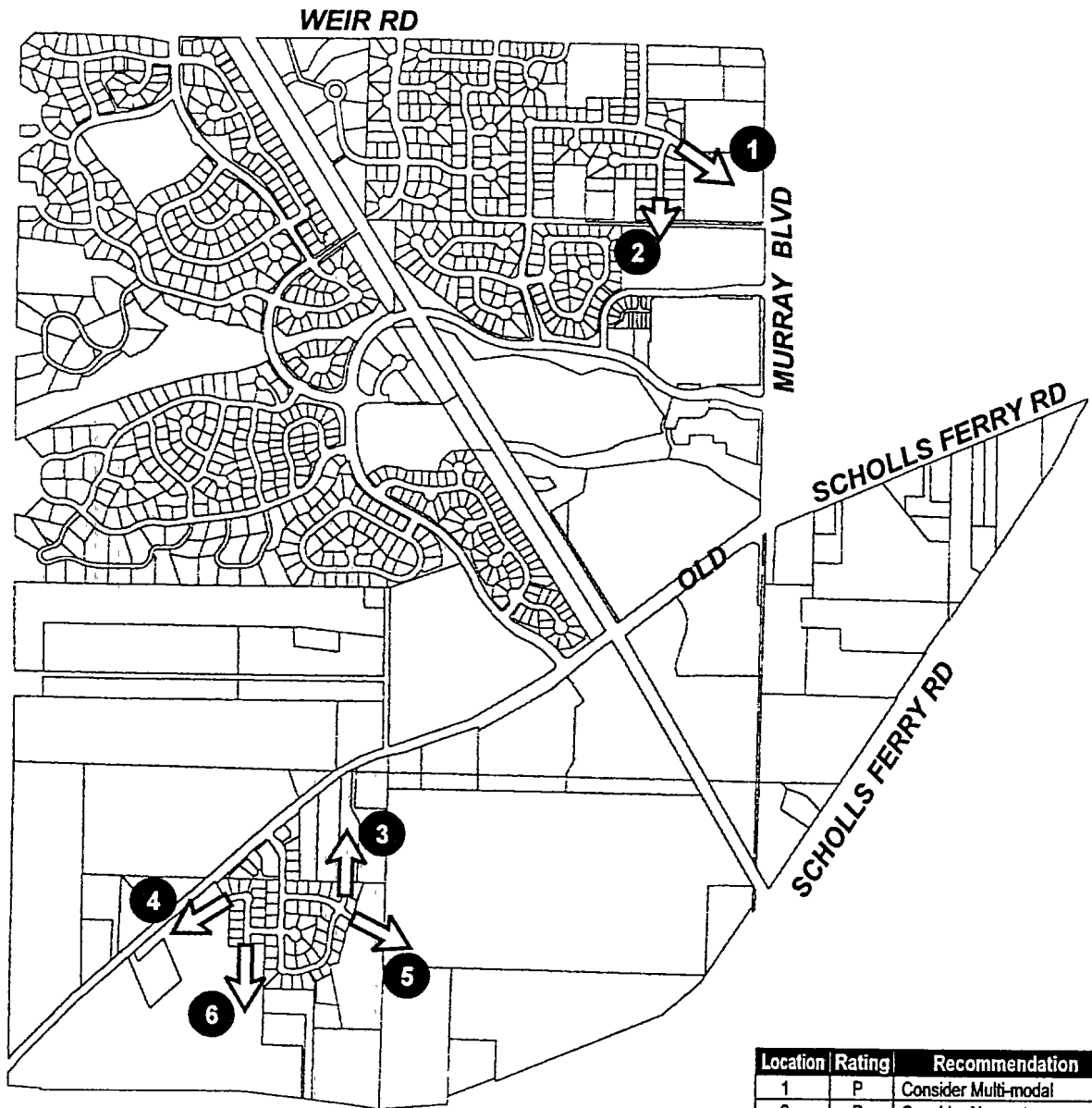
Location	Rating	Recommendation
1	M	Pursue Multi-modal
2	M	Pursue Multi-modal

M = Minimal Problems
P = Potential or Definite Problems

LEGEND

- Potential Connection
- Street Stub Identification Number

Figure 8-18
LOCAL STREET CONNECTIVITY
Greenway



Location	Rating	Recommendation
1	P	Consider Multi-modal
2	P	Consider Non-auto
3	M	Pursue Multi-modal
4	M	Pursue Multi-modal
5	M	Pursue Multi-modal
6	M	Pursue Multi-modal

M = Minimal Problems
P = Potential or Definite Problems

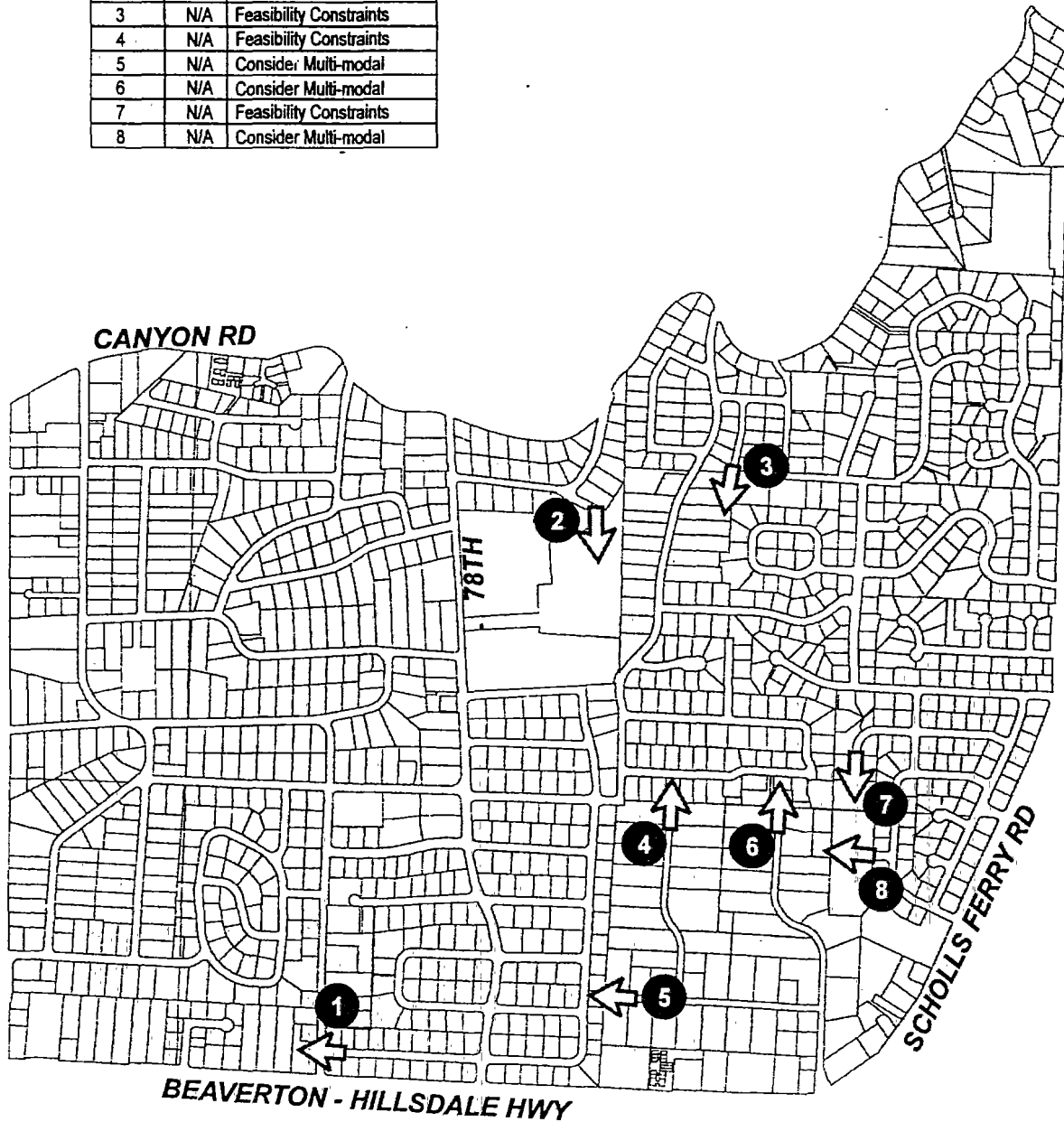
LEGEND

- Potential Connection
- Street Stub Identification Number

Figure 8-19
LOCAL STREET CONNECTIVITY
Neighbors Southwest



Location	Rating	Recommendation
1	N/A	Consider Multi-modal
2	N/A	Pursue Non-auto
3	N/A	Feasibility Constraints
4	N/A	Feasibility Constraints
5	N/A	Consider Multi-modal
6	N/A	Consider Multi-modal
7	N/A	Feasibility Constraints
8	N/A	Consider Multi-modal



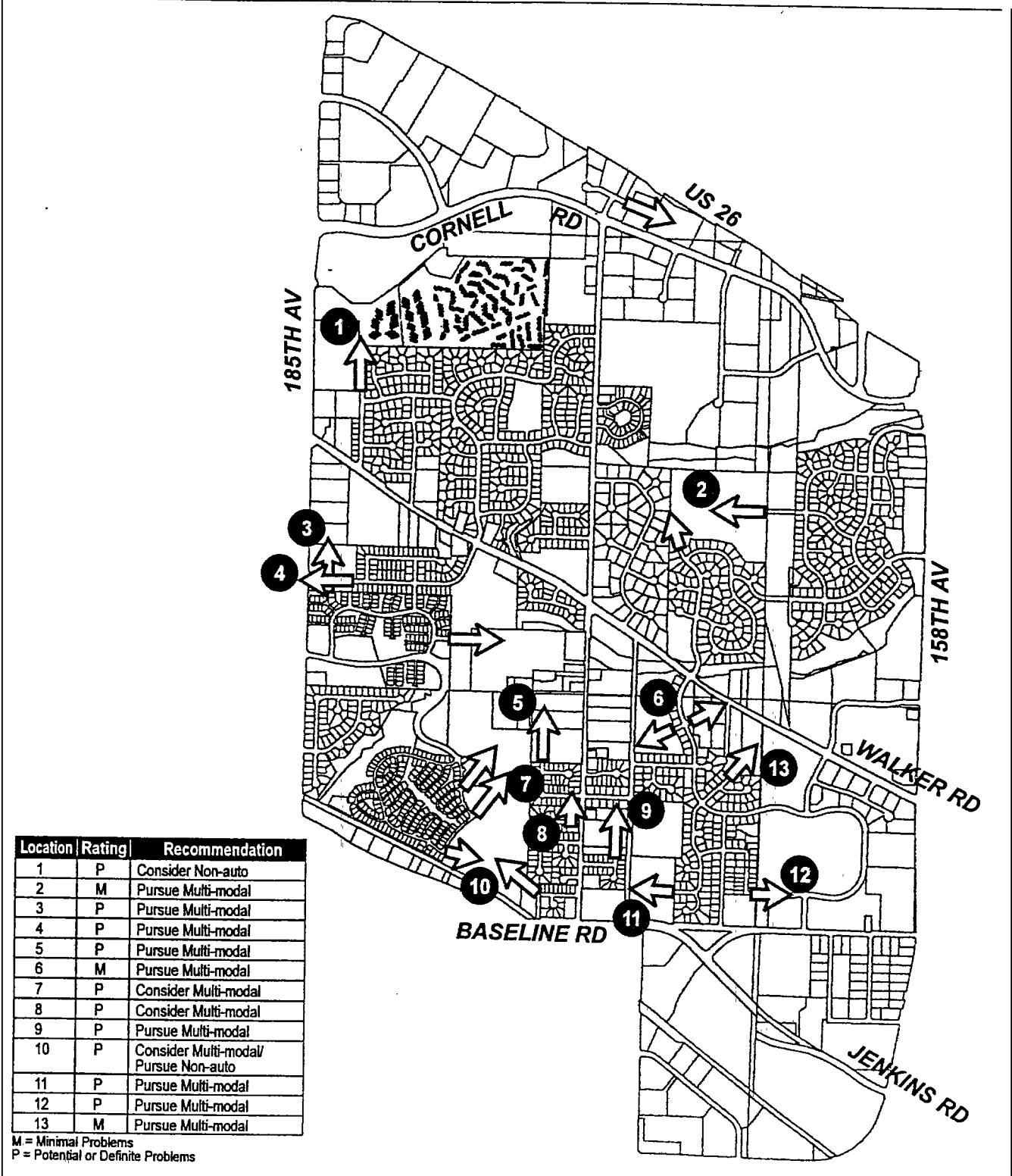
Note: Connections identified outside the City of Beaverton limits are only recommendations to Washington County.

LEGEND

← - Potential Connection

00 - Street Stub Identification Number

Figure 8-20
LOCAL STREET CONNECTIVITY
Raleigh Park



LEGEND



- Potential Connection



- Street Stub Identification Number

Figure 8-9
LOCAL STREET CONNECTIVITY
Triple Creek/Five Oaks

area. This 2015 forecast included the Westside LRT and the highest level of transit service given regional funding constraints¹³. It assumes that Transportation Demand Management (TDM) will occur and that significant shifts to transit will occur (from existing levels at 1 to 3 percent of total person trips to 8 to 15 percent in LRT station areas). The initial 2015 test was performed on a street network similar to today's system (without improvements). Problem areas were identified and alternative improvements were developed to address deficiencies. Performance was evaluated using a three tiered assessment of capacity and operations.

- Demand to capacity ratios were evaluated on roadway segments and conditions where the demand to capacity ratio exceeded 1.0 were studied for potential improvement alternatives.
- Intersection level data were developed for about 80 intersections in Beaverton (based upon **staff** input, primarily arterial and collector intersections). Alternative improvements were considered where level of service was F or worse. Mitigated levels of service (LOS) were generally brought to the **LOS D** or **E** range for the 20 year planning assessment. Demand to capacity ratios of below 1.0 were sought, but mitigation typically was stopped **if** D/C ratios were slightly above 1.0 and feasibility of further improvement was considered questionable.
- Where improvements beyond the Metro functional plan desire of five lanes became apparent, the system level of service (arterial system rather than one intersection - looks at travel speed on segment usually one to two miles) was initially tested to seek mitigation to LOS D (Chapter 11 of the Highway Capacity Manual).

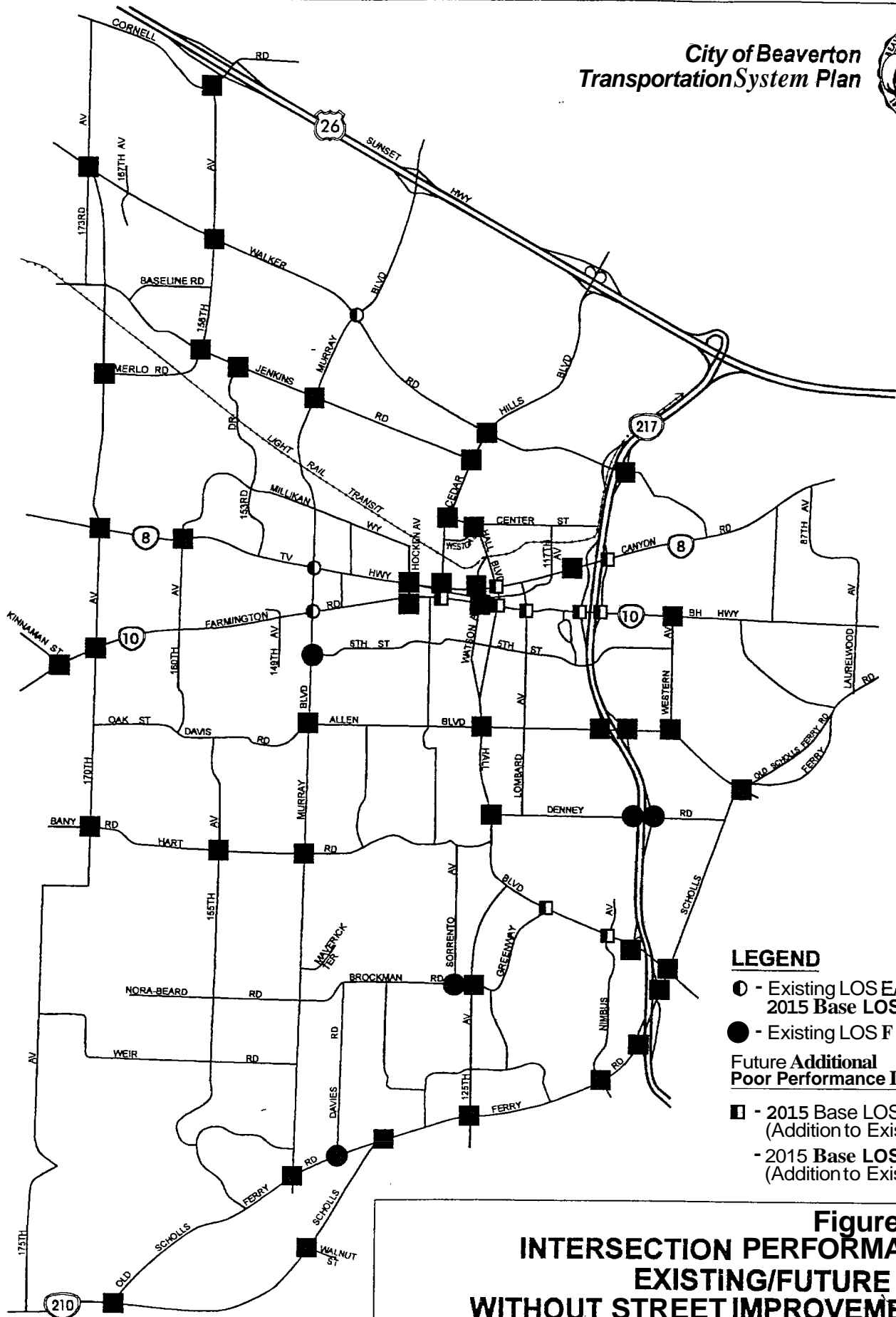
Assessment of Need

Based upon the evaluation of intersection level of service, over 62 intersections operate at or worse than level of service E in the 2015 evening peak hour with no improvements (Figure 8-21). This compares with **4** intersections operating at these levels today. **The** impact of future growth would be severe without significant investment in transportation improvements. Travel speeds would be below **5 MPH** over long stretches **of road** (**3 to 8** mile segments of roadways) resulting in unmanageable congestion. Poor performance on freeways and arterials would result in substantial impacts (added through traffic) to neighborhood and collector routes. The greatest problem areas **can** be grouped into the following areas:

- **Lack of east-west capacity.** Virtually every east-west route in Beaverton from Scholls Ferry Road north to Walker Road would be over capacity.
- **Lack of north-south capacity.** ORE 217, Murray Road, Hall Boulevard, Cedar Hills Boulevard and 185th Avenue to the west all experience demands well in excess of capacity.

¹³ This system assumes the westside rail and all the feeder bus system that supports it. Other westside bus service is provided **also**. The system design is essentially that which will be in place when the westside rail opens next year, with better headways. The south/north **rail** system is also assumed in place **for** this scenario.

**City of Beaverton
Transportation System Plan**



**Figure 8-21
INTERSECTION PERFORMANCE
EXISTING/FUTURE 2015
WITHOUT STREET IMPROVEMENTS**

- **Lack of freeway crossings results in traffic concentrations at interchanges.** Throughout Beaverton there are few places to cross the freeways except at interchanges (Cabot and Fifth on ORE 217 are examples). This results in interchange areas not only serving high freeways access needs, but through arterial traffic and local circulation. This results in congestion at interchanges.
- **Lack of mainline freeway capacity.** Both US 26 and ORE 217 would be over capacity without widening. This condition exists on ORE 217 over its entire length. On US 26, the imbalance between demand and capacity is most prevalent east of 185th Avenue.
- **Lack of local street system and connectivity.** Areas adjacent to 170th/185th between Farmington and Cornell and the downtown area are the best examples, where all **through** moving traffic and much of the local access must use the arterials.
- **Lack of intersection turning capacity.** Many intersections experience LOS F conditions, not for need of through capacity, but the need for additional right or left turning capacity.
- **Lack of adequate means to cross arterials.** Traffic volumes increases are such that the ability to cross or access arterial/collector routes in the future is very difficult. Traffic signal control **must** be planned to allow adequate control for autos, bikes and pedestrians, while not resulting in disruption caused by placing signals at low priority locations, such as private site driveways, or at locations too close to existing traffic signals.

Recommended Improvement Plan

To address these seven deficiencies, a series of alternatives **and** strategies were considered. **The range** of strategies includes:

- **Do nothing:** This results in severe impacts to circulation in Beaverton with delays which would not be tolerable. Extreme land use controls would be required to protect livability.
- **Assume that alternative modes can serve excess demand.** The TSP analysis assumed that these would be developed to their optimal levels. The order of magnitude of trips to be served in 2015 goes well beyond the capacity of the alternative mode systems by themselves, even at their optimal levels. The estimated growth in PM **peak** hour trips (over 50,000) far exceeds the capacity of the alternative modes by themselves to support this demand.
- **Build all the road capacity necessary to achieve level of service D conditions at intersections.** This strategy would result in nearly doubling the cost of the improvements identified in this plan. For example, many five lane cross sections would need to become seven lanes.

- **Pragmatically add capacity to all modes, developing a balanced system. Outline the long term configuration of streets to allow development to best accommodate needs. Allow LOS E at intersections and maintain system performance measures at LOS D.**
This is the strategy that was pursued. It involves significant system improvements, but is the only alternative that balances performance between modes.

The mitigation measures for the street system are outlined in a series of graphics and tables. Figure 8-22 outlines the street improvements, which are summarized in Table 8-3. Figure 8-23 locates the intersections where improvements will be needed and Table 8-4 summarizes the type of improvement identified. Each of the problem areas noted above have been addressed in the following manner:

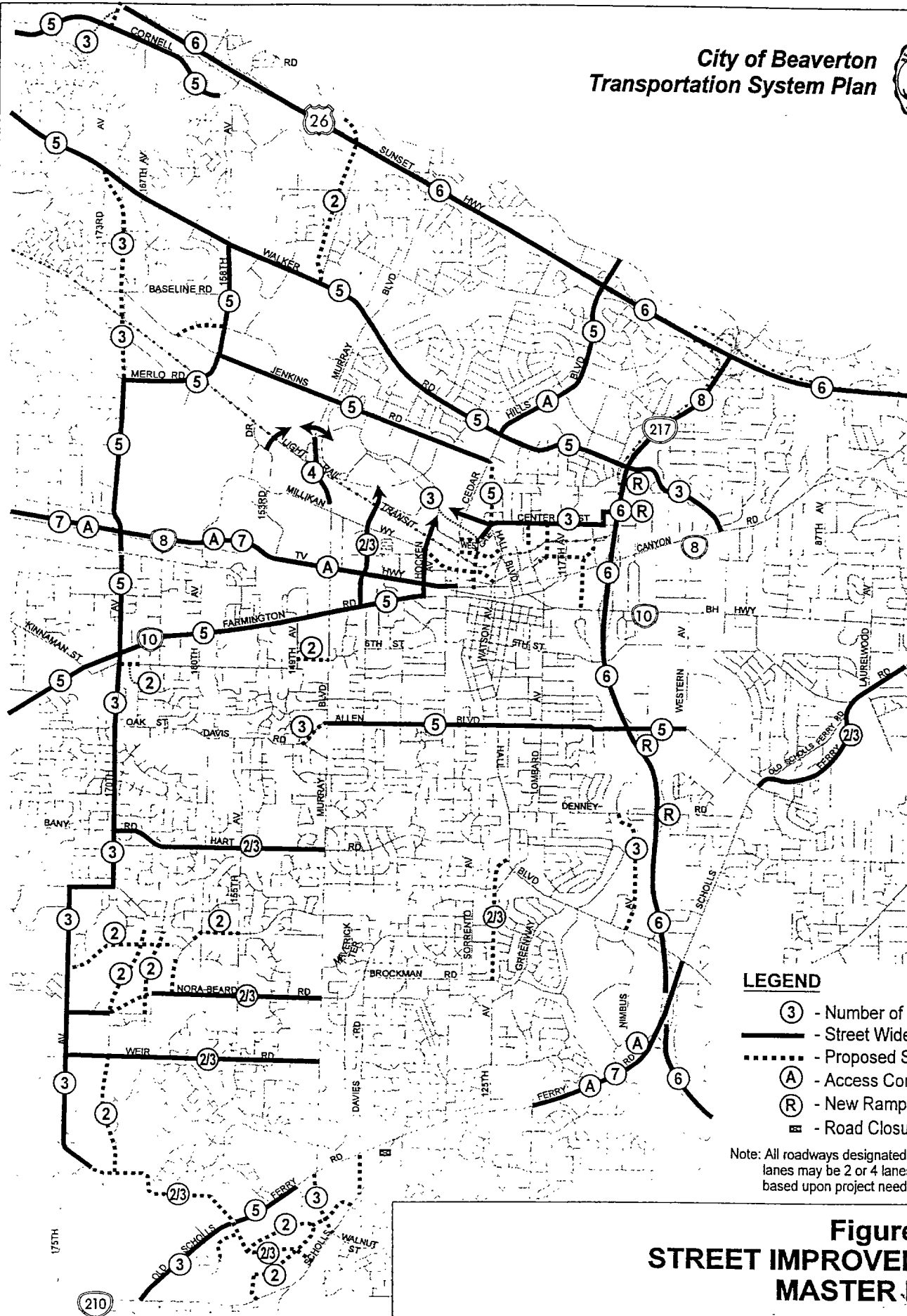
East-West Capacity: Roadway widenings are outlined for Walker Road (5 lane), Center Street (3 lane), Jenkins Road (5 lane), Millikan Avenue extension, TV Highway (7 lanes) west of Cedar Hills, Farmington Road (5 lanes), Allen Boulevard (5 lanes) and Scholls Ferry Road (7 lanes). In addition, access control strategies will need to be developed specifically for TV Highway, Scholls Ferry Road and Cedar Hills Boulevard. In each case, capacity is constrained and one strategy (rather than widening) that can be applied is to reduce the number of access points. In doing so, capacity can be enhanced 10 to 20 percent. What makes these cases different from other routes in Beaverton is that existing access would have to be purchased and/or closed. Access spacing standards and existing access conditions would be adequate on other routes.

North-South Capacity: Roadway improvements include development of the 170th/173rd/175th corridor, Cedar Hills Boulevard (finish 5 lanes), Hall linkage to Jenkins, and widening the Murray overcrossing of LRT.

Lack of Freeway Crossings: Two new crossings of US 26 are identified. Crossings were tested at every segment of US 26 between interchanges. The two sites which attract the greatest use and mitigate congestion are a crossing of 173rd/174th and a 143rd overcrossing. Other sites did not mitigate congestion problems. The 173rd/174th crossing attracts 15,000 to 20,000 vehicles per day (without any freeway ramps). The 143rd crossing was recommended by Washington County staff and found to be effective at mitigating problems on Murray Road between Walker Road and Cornell Road (the alignment will require significant alternatives analysis and refinement).

Mainline Freeway Capacity. Additional lanes on US 26 (six lanes west to 185th) and ORE 217 (entire length) are needed to mitigate congestion. Auxiliary lanes will be necessary on both facilities to mitigate impacts of high ramp volumes. Particularly on ORE 217, the close spacing of interchanges will require extensive mitigation which involves ramp braiding. Closure of freeway access was rejected due to severe impacts to the arterial street system. However, combining access point (particularly Denney and Allen or Walker and Cabot) would be recommended to reduce the impact of ramp volumes on mainline freeway operation. Benefit and performance of HOV lanes will need to be studied further as the ORE 217 project goes into corridor assessment.

City of Beaverton Transportation System Plan



LEGEND

- ③ - Number of Lanes
- - Street Widening
- - Proposed Street
- Ⓐ - Access Control Strategy
- Ⓡ - New Ramps
- ▨ - Road Closure

Note: All roadways designated with 3 or 5 lanes may be 2 or 4 lanes (respectively), based upon project needs.

**Figure 8-22
STREET IMPROVEMENT
MASTER PLAN**

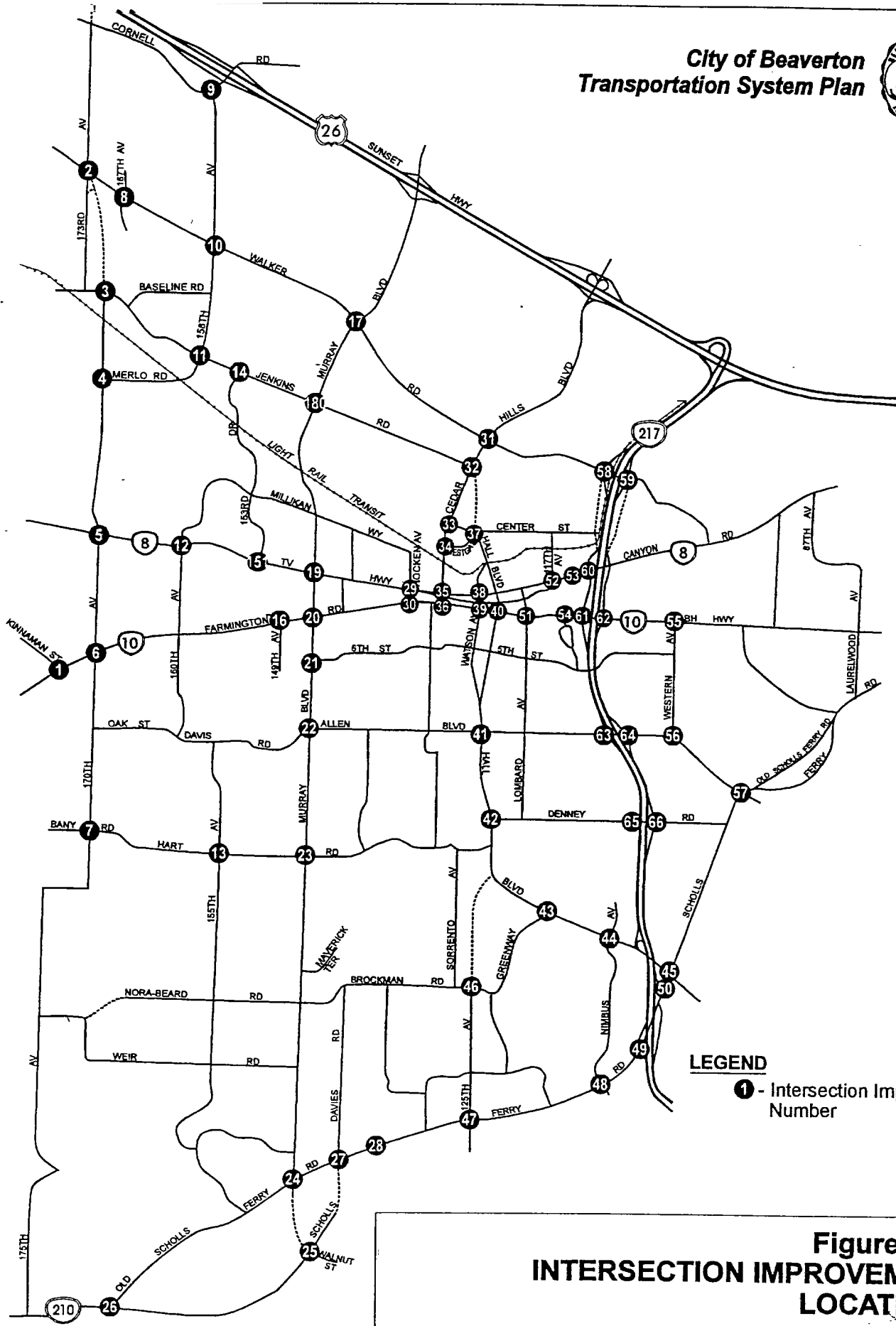
Table 8-3
Future Street Improvements

Roadway/Intersection	Improvement	Jurisdiction
Projects Included in the RTP/MSTIP/STIP/CIP Funding Programs		
Farmington Road	Widen to 5 lanes with bike lanes from Murray Boulevard to 173 rd Avenue.	ODOT
Farmington Road	Widen to 5 lanes with bike lanes from 173 rd to 209th	Wash Co/ODOT
170 th Avenue	Widen to 3 lanes with sidewalks and bikeway from Rigert to Blanton to Alexander	Wash Co/MSTIP
170 th /173 rd Avenue	Construct new road and widen existing road to three lanes with sidewalks and bikeway from Baseline Road to Walker Road.	Wash Co/MSTIP
Jenkins: Murray to 158th	Widen to 5 lanes MM	Wash Co.
Jenkins: Cedar Hills to Murray	Widen to 3 lanes MM	Wash Co.
Allen: Menlo to Main	Widen to 5 lanes	City
Davis Road	Widen road and add bike and pedestrian facilities from Allen to 170 th Avenue.	City/MSTIP
Scholls Ferry Road	Add turn lanes and bike lanes to Scholls Ferry/Old Scholls Ferry from east of the Beaverton city limits to 175 th Ave. Realign the Scholls Ferry/Old Scholls Ferry and Scholls Ferry/Beef Bend intersections, adding turn lanes and traffic signals.	ODOT/Wash Co
Walker Rd: Murray to 185th	Widen to 5 lanes with bike lanes and sidewalks	Wash Co
Cornell Road: 158th to 185th	Widen to 5 lanes with bike lanes and sidewalks	Wash Co
Murray Boulevard Overcrossing	Widen to four lanes Millikan to Terman	Wash Co.
Lombard: Broadway to Farmington	Realign roadway to align with segment to the north (3 lanes)	City/MSTIP
Lombard: LRT to Center	Extend 3 lane section with sidewalks	City
125 Avenue: Greenway to Hall	Extend 3 lane section with sidewalks	City
6 th /Division: Murray to 149th	Extend 2 lane roadway	City
Millikan: Hocken to Cedar Hills	Extend Millikan to the east to connect to Cedar Hills at Henry Street	City/MSTIP
US 26: ORE 217 to Murray	Widen highway to 6 lanes and add braided ramps	ODOT
Canyon Road: ORE 217 to 117 th	Provide median access control, relocate traffic signal, add turn lanes	ODOT
ORE 217: US 26 to Canyon	Widen highway and complete ramp work	ODOT
ORE 217: Canyon to 72nd	Provide additional travel lane each way and rebuild auxiliary lanes	ODOT
Murray Boulevard: Farmington to Millikan	Traffic signal interconnect	ODOT
Hall Boulevard	Add southbound right turn lane at Scholls Ferry Road	ODOT
Projects NOT included in current funding programs		
170th: Division to Blanton	Widen to 5 lanes/MM	Wash Co
170th: Alexander to Merlo	Widen to 5 lanes/MM	Wash Co

Roadway/Intersection	Improvement	Jurisdiction
170th: Merlo to Baseline	Widen to 3 lanes/MM	Wash Co
173rd: Cornell to Bronson	Build new 2/3 lane roadway with grade separation of US 26 connecting to 174th/MM	Wash Co/ODOT
158th/Merlo: 170th to Walker	Widen to 5 lanes/MM	City
Murray: Old Scholls to Scholls Ferry	Extend 3/5 lane roadway to Walnut/MM	Wash Co
Davies: Old Scholls to Scholls Ferry	Extend 3 lane road south linking to Scholls Ferry/MM - Close Old Scholls Ferry/Scholls Ferry east intersection	City
Cedar Hill Blvd: Walker to US 26	Complete 5 lane roadway/MM/Access Control	Wash Co
143rd/Meadow: Science Park to Walker	Establish a new 2 lane roadway connection, including a grade separation of US 26/MM	Wash Co
Walker Road: Murray to ORE 217	Widen to 5 lanes/MM	Wash Co
Jenkins Road: Murray to Cedar Hills	Widen to 5 lanes/MM	Wash Co
TV Highway: Cedar Hills to 185 th	Widen to 7 lanes/MM	ODOT
TV Highway: 117th to Hillsboro	Access Control strategies to improve lane capacities	ODOT
Farmington: Hocken to Murray	Widen to 5 lanes/MM	ODOT/City
Allen: ORE 217 to Western	Widen to 5 lanes/MM	City
Allen: ORE 217 to Murray	Complete 5 lane widening/MM	City
Bany/Hart: 170th to Murray	Improve to 2-3 lanes/MM	Wash Co
Beard/Nora: Murray to 175th	Improve to 2-3 lanes/MM	Wash Co
Weir: Murray to 170 th	Improve roadway with 3 lanes/MM	City
Scholls Ferry: Hall to 121st	Widen to 7 lanes including access control measures at unsignalized locations/MM	Wash Co
Hall north of Center	Extend new 5 lane roadway north of Center to connect with Jenkins at Cedar Hills Blvd/MM	City
Center: 114 to Cedar Hills	Widen to 3 lanes/MM	City/Co
Center: Cedar Hills to Karl Braun	Extend public roadway 3 lanes/MM	City
141st: Tek to Farmington	Realign and extend 2/3 lane roadway/MM	City
US 26: 185th to Murray	Widen highway to 6 lanes, install auxiliary lanes as warranted between interchanges	ODOT
US 26: 185th to ORE 217	Interchange ramp improvements	ODOT
Local Streets: Downtown Area	Henry Street, Rose Biggi, 114th/Griffith, Broadway extension and others per Regional Ctr	City
Local Streets: NW Beaverton	185th/Cornell/170th/TV Highway - add local connectivity	City
Local Streets: SW Beaverton	175th/Weir/155th/Sexton Mountain - add local connectivity	City
Local Street: Scholls	Scholls Ferry to 175th north to Alvord - add local and collector connectivity	City

MM - Multi-modal improvement including sidewalks and bicycle lanes

**City of Beaverton
Transportation System Plan**



LEGEND

- ① - Intersection Improvement Number

**Figure 8-23
INTERSECTION IMPROVEMENT
LOCATIONS**

**Table 8-4
City of Beaverton 2015 Intersection Improvements**

Improvement Number	Intersection	Description
1	Kinnaman/Farmington Road	Widen Farmington to 5 lanes; add WB left turn lane; add NB/SB left turn lane; signal phasing modification to NB/SB permitted/protected phasing
2	Walker Road/173 rd Avenue	Widen Walker Road to 5 lanes; add EB/WB right turn lanes; NB/SB double left turn lanes
3	Baseline Road/170 th Avenue	SB double left turn lanes; signal phasing modification of NB/SB to protected phasing; add WB right turn lane
4	Merlo Road/170 th Avenue	Signal phase change to permitted/protected for NB/SB approaches and to protected phasing for EB/WB approaches; add NB right turn lane; add NB, SB, and EB left turn lanes
5	TV Highway/170 th Avenue	Widen TV Highway to 7 lanes (3 through lanes each way); widen 170 th Avenue to 5 lanes; add SB right turn lane; WB double left turn lanes
6	Fannington Road/170 th Avenue	Widen Farmington Road to 5 lanes; add NB left turn lane; add NB through lane and restripe SB for additional through lane (widen 170 th Avenue to 5 lanes)
7	Hart-Bany/170 th Avenue	Install traffic signal; add NB and SB left turn lanes
8	Walker Road/167 th Avenue	Install traffic signal; widen Walker Road to 5 lanes
9	Cornell Road/158 th Avenue	Add EB right turn lane
10	Walker Road/158 th Avenue	NB/SB double left turn lanes; add EB right turn lane; NB right turn
19	TV Highway/Murray Boulevard	Double left turn lanes on all approaches; add EB/WB right turn lanes; add NB/SB through lane (3 through lanes each way)
20	Murray Boulevard/Farmington Road	Double left turn lanes on all approaches; SB, EB and WB right turn lanes
21	Murray Boulevard/6 th Avenue	Install traffic signal; add EB and WB left turn lanes
22	Murray Boulevard/Allen Boulevard	Widen Allen to 5 lanes to Murray (drop additional WB through lane after Murray); add SB right turn lane
23	Murray Boulevard/Hart Road	Signal phase change to permitted/protected phasing for all approaches
24	Murray Boulevard/Old Scholls Ferry Road	Restripe NB, SB and EB approaches; signal phase change to protected phasing on all approaches
25	Murray Boulevard/Scholls Ferry Road/Walnut Street	Install traffic signal; add EB left turn lane; restripe NB approach; construct SB approach with left turn lane

26	Scholls Ferry Road/Old Scholls Ferry Road (west)	Install traffic signal; add southbound right turn lane and restripe existing lane as a left turn lane
27	Old Scholls Ferry Road/Davies Road	Install traffic signal; restripe WB approach; add NB right turn lane; add NB left turn lane
28	Scholls Ferry Road/Old Scholls Ferry Road (east)	Road closure of Scholls Ferry Road
29	TV Highway/Hocken Avenue	Add EB right turn lane; restripe SB approach; widen Hocken to 2 southbound through lanes
30	Farmington Road/Hocken Avenue	Add WB right turn lane; SB double left turn lanes (Hocken carries 2 SB lanes from TV Highway)
31	Cedar Hills Boulevard/Walker Road	Double left turn lanes on all approaches; add EB right turn lane
32	Cedar Hills Boulevard/Jenkins Road	SB and EB double left turn lanes; add SB right turn lane; widen Jenkins to 5 lanes; WB right turn channel; signal modification to EB/WB protected phasing
32	TV Highway/160 th Avenue-Millikan	Widen TV Highway to 7 lanes (3 through lanes each way)
33	Cedar Hills Boulevard/Hall Boulevard	Add NB right turn lane
34	Cedar Hills Boulevard/Westgate Drive	Add NB left turn lane
35	Canyon Road/Cedar Hills Boulevard	Widen TV Highway to 7 lanes (3 EB/WB through lanes in each direction; signal modification to protected phasing for all approaches; NB double left turn lanes; add SB left turn lane; add SB right turn lane; add EB/WB right turn lane;
36	Farmington Road/Cedar Hills Boulevard	SB double left turn lanes (construct SB right turn lane and restripe SB lanes as left turn lanes)
37	Hall Boulevard/Westgate-Center	Realign intersection, signal modification to EB/WB protected/permitted phasing
38	Canyon Road/Watson Avenue	Restripe SB approach (add a SB receiving lane)
39	Farmington Road/Watson Avenue	Add southbound through lane
40	Farmington Road/Hall Boulevard	Restripe NB approach (add NB receiving lane)
41	Hall Boulevard/Allen Boulevard	Add EB and WB right turn lanes; NB and SB double left turn lanes
42	Hall Boulevard/Denney Road	NB/SB signal phasing change to permitted/protected phasing; restripe WB approach
43	Hall Boulevard/Greenway	Signal phase change to permitted/protected phasing for EB and WB approaches
44	Hall Boulevard/Nimbus Avenue	Signal phase change to protected/permitted phasing for NB and SB approaches
45	Scholls Ferry Road/Hall Boulevard	Add double left turn lanes on all approaches; add right turn lanes on all approaches
46	Brockman Road/125 th Avenue	Signal phase change to protected/permitted phasing for all approaches; add WB left turn lane; restripe NB and EB approaches; construct SB left turn lane, right turn lane and through lane
47	Scholls Ferry Road/125 th Avenue	Widen Scholls Ferry Road to 7 lanes (3 through lanes each way); add SB right turn lane
48	Scholls Ferry Road/Nimbus Avenue	Widen Scholls Ferry Road to 7 lanes (3 through lanes each way); add NB left turn lane; SB double left turn lanes
49	Scholls Ferry Road/ORE 217 SB ramps	Channelize EB right turn onto ramp and modify signal to allow free movement of EB right turns
50	Scholls Ferry Road/ORE 217 NB on-ramp	Channelize SB right turn onto ramp and modify signal to allow free movement of EB right turns; add WB through lane onto ramp (2 through lanes)
51	Farmington Road/Lombard Avenue	Add NB right turn lane
52	Canyon Road/	Add WB right turn lane; signal modification to NB/SB protected

	Broadway-]17 th Avenue	phasing
53	Canyon Road/Fred Meyer Access	Add SB left turn lane; signal modification to NB/SB split phasing
54	Beaverton-Hillsdale Highway/ Griffith Drive	Signal phasing modification to NB/SB protected/permitted phasing
55	Beaverton-Hillsdale Highway/Western Avenue	Add EB right turn lane; add WB double left turn lanes; add NB through lane
56	Allen Boulevard/Western Avenue	Add EB left turn lane; EB/WB signal phasing change to permitted/protected phasing
57	Allen Boulevard/Scholls Ferry Road	Widen Allen Boulevard to 5 lanes; restripe WB approach; signal phase change for all approaches to permitted/protected phasing
58	Walker Road/ORE 217 SB ramps	Big cost/bridge deck widening: EB double right turn lanes (add right turn lane); WB through lane
59	Walker Road/ORE 217 NB ramps	Add NB double left turn lanes
60	Canyon Road/ORE 217 SB ramps	Add SB left turn lane and restripe SB lanes
61	Beaverton-Hillsdale Highway/ ORE 217 SB ramps	Add SB left turn lane
62	Beaverton-Hillsdale Highway/ ORE 217 NB ramps	NB double left turn lanes
63	Allen Boulevard/ORE 217 SB ramps	Add SB right turn lane (double right lanes); EB right turn lane (channel onto ramp, signal modification to allow EB right turn to go with SB left
64	Allen Boulevard/ORE 217 NB ramps	Add WB right turn lane; signal modification to NB/SB split phasing
65	Denney Road/ORE 217 SB ramps	install traffic signal
66	Denney Road/ORE 217 NB ramps	install traffic signal

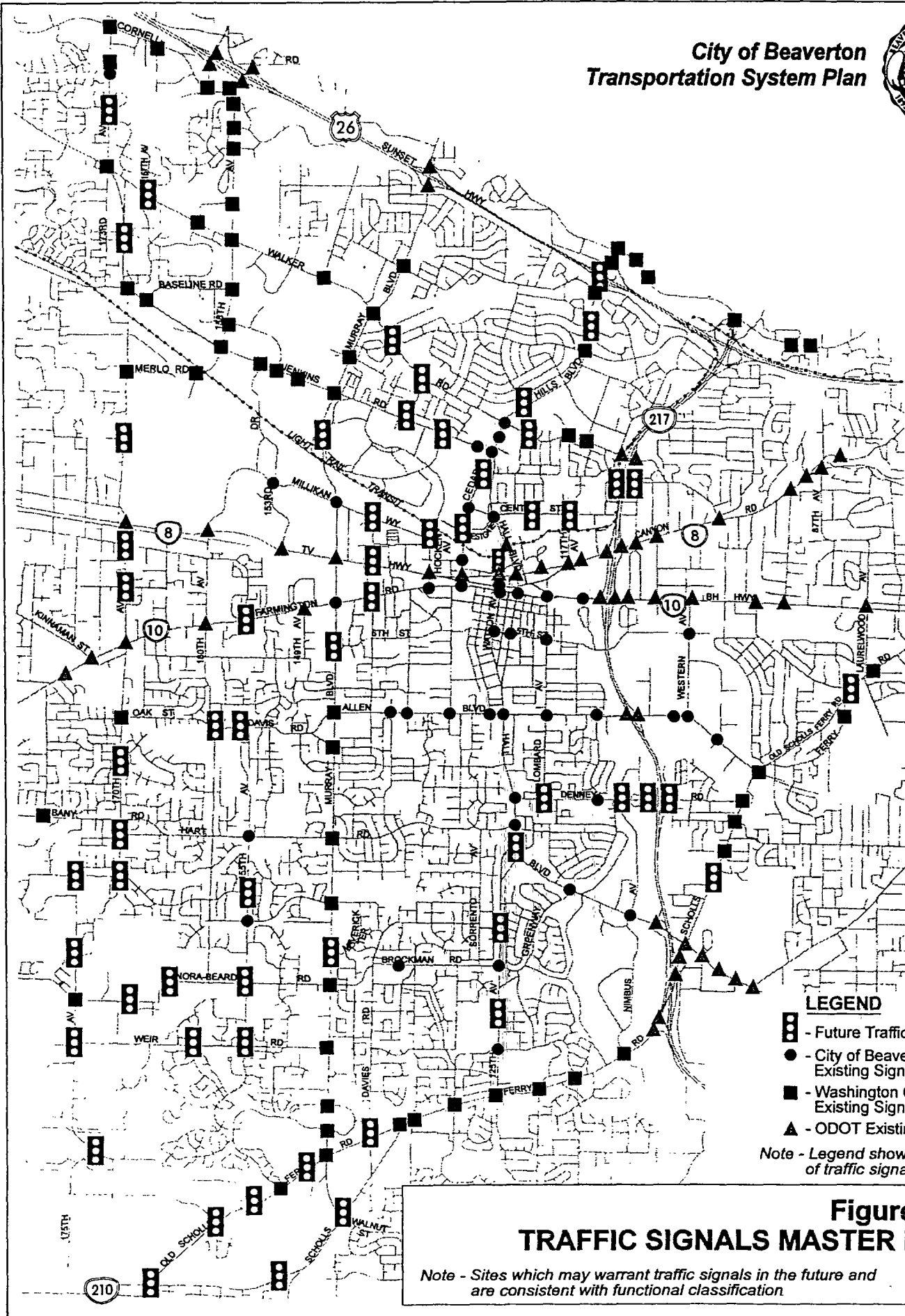
Local Street System and Connectivity: Four areas were noted where local connectivity would result in benefits to both the arterial system and the neighborhood/local system by dispersing traffic (rather than one street with residential frontage experiencing significant impacts). These areas include the downtown regional center, the areas between 170th and 185th Avenues south of Cornell and north of Farmington, areas in southwest Beaverton and the area between Old Scholls Ferry Road and Scholls Ferry Road.

Intersection Turning Capacity: A series of 65 intersection improvements were identified which primarily add turning movement capacity.

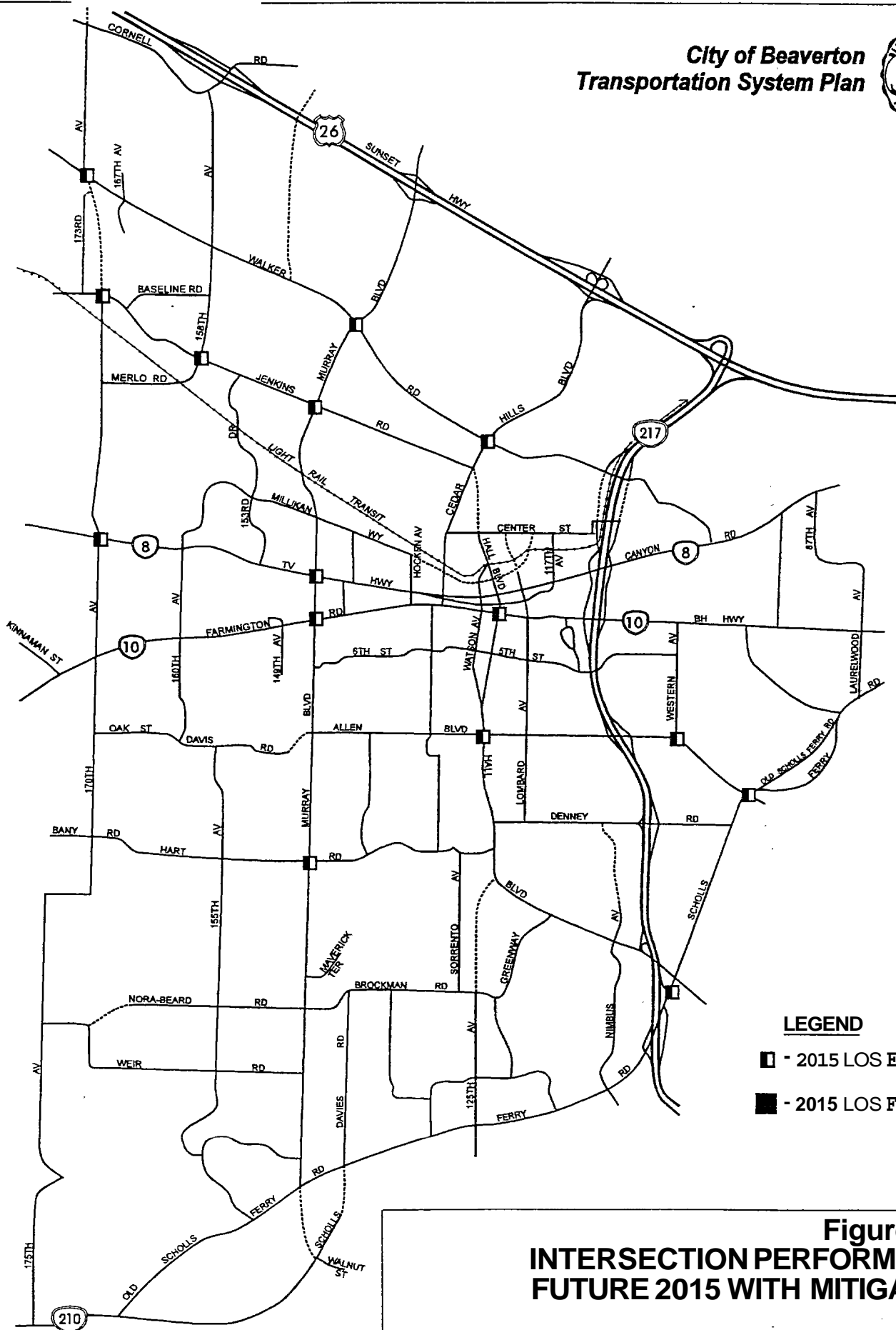
Means to Cross Arterials (Traffic Signals): To guide future implementation of traffic signals to locations which have the maximum public benefit by serving arterial/collector/neighborhood routes, a framework master plan of traffic signal locations was developed (Figure 8-24). The intent of this plan is to outline desirable locations where future traffic signals would be placed to avoid conflicts with other development site oriented signal placement. To maintain the best opportunity for efficient traffic signal coordination, spacing of up to 1,000 feet should be considered. No traffic signal should be installed unless it meets MUTCD warrants.

The result of these improvements is significant. While level of service E conditions still exist for the most part the 2015 traffic conditions can be mitigated to the point that mobility can be preserved in Beaverton and congestion is manageable. Only 15 intersections operate at LOS E (none at F) (Figure 8-25) compared to over 62 intersections if improvements are not made. The extent of certain street

**City of Beaverton
Transportation System Plan**



**City of Beaverton
Transportation System Plan**



LEGEND

- - 2015 LOS E
- - 2015 LOS F

**Figure 8-25
INTERSECTION PERFORMANCE
FUTURE 2015 WITH MITIGATION**

improvements goes beyond RTP and Functional Plan desires to not have seven lane streets. Scholls Ferry Road was designated in the Washington County Transportation Plan as seven lanes. Canyon/TV Highway has not been designated in prior plans for seven lanes. In both ~~on~~ these cases, every transit/TDM oriented strategy should be implemented prior to consideration of seven lane improvements. However, using the travel forecasts for 2015 which include transit and TDM improvements, the analysis indicates that an ultimate seven lane improvement should be planned for in the next 20 years.

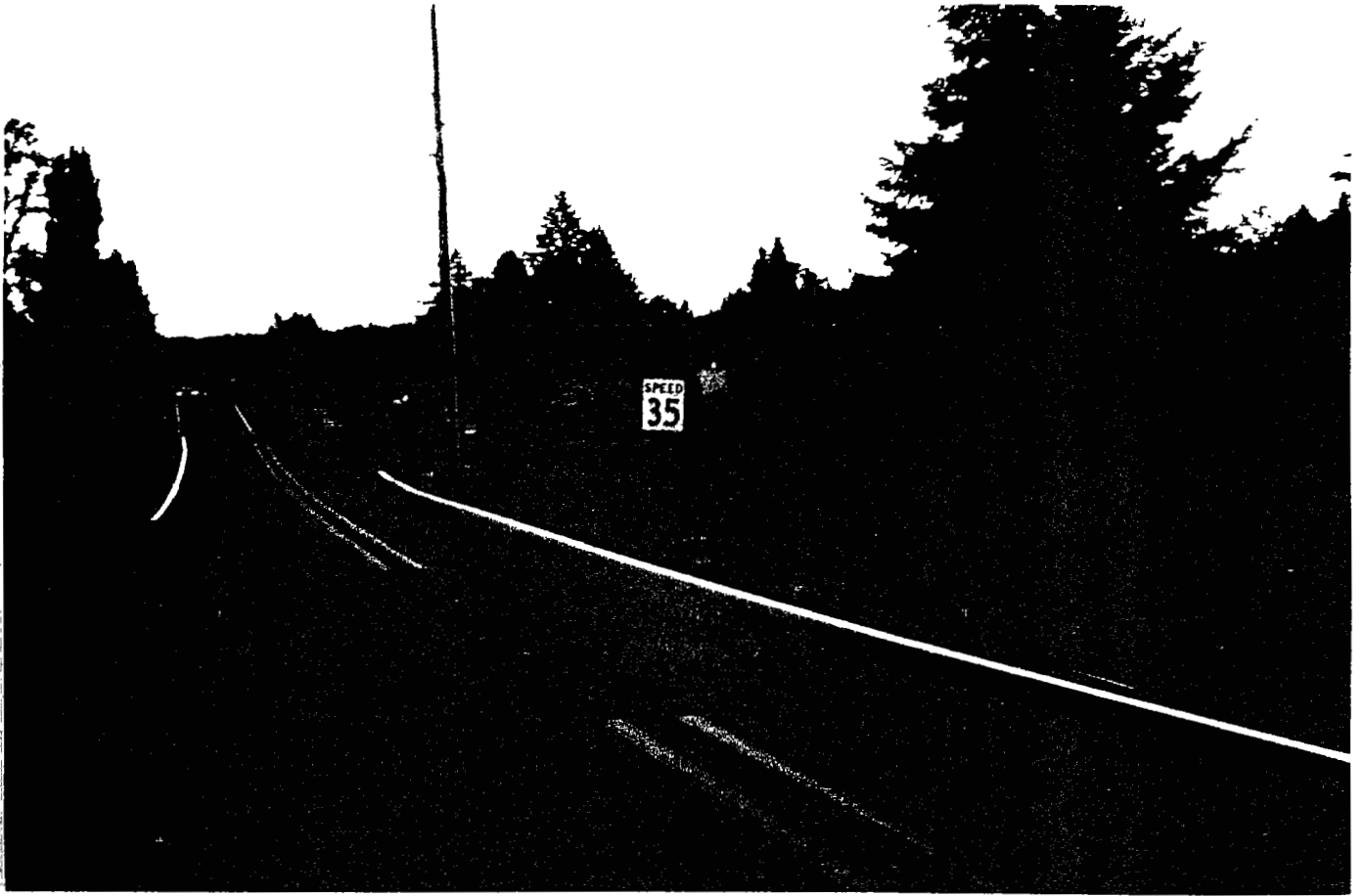
Visual Simulations

The previous sections have focused on the quantitative aspects of the transportation system and its operation. To provide a better understanding of the character of the street improvements that have been discussed, a set of visual simulations were undertaken. Using a computer to simulate hypothetical characteristics of the recommended improvements, a set of illustrations were developed showing existing conditions and changes with the proposed improvements (Figures 8-26 and 8-27). These two photographs provide a comparison of the improvements on 173rd crossing of US **26** and of the proposed three lane section of 170th Avenue north of Bany Road. The roadway locations and characteristics shown in the visual simulation are only approximate in nature and do not reflect the specific character or design intended for the area. The technical appendix provides additional visual simulations for reference (on 170th north of Farmington, Scholls Ferry Road at 121st, ORE 217 at Walker and TV Highway near 170th).

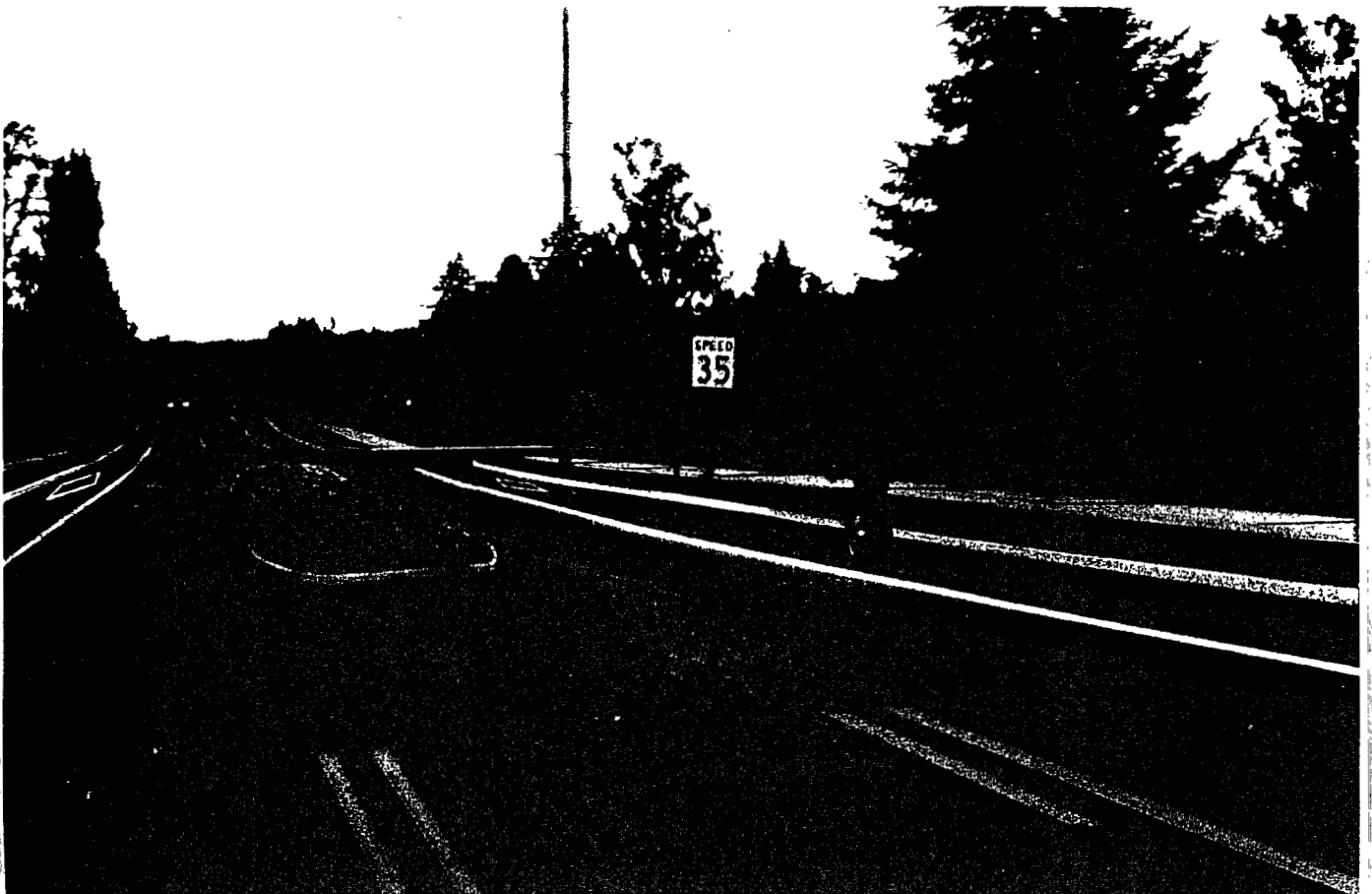
SAFETY

Accident data is difficult to forecast to the future and therefore analysis focuses on the existing information. The City of Beaverton has identified the ten highest accident locations in need of safety improvements based on accident data. The City of Beaverton's ten highest accident locations ~~for~~ 1994 to 1996 are shown in Figure 8-28 and summarized in Table 8-5.

Rank	Location	Number of Accidents
1	SW Murray Boulevard/SW TV Highway	71
2	SW 158 th Avenue/SW Walker Road	56
3	SW Farmington Road/SW Murray Boulevard	48
4	SW Allen Boulevard/SW Murray Boulevard	47
5	SW Hall Boulevard/SW Scholls Ferry Road	40
6	Highway 217/SW Allen Boulevard	36
7	SW Allen Boulevard/SW Menlo Drive	34
8	SW Allen Boulevard/SW Hall Boulevard	29
9	Highway 217/SW Canyon Road	29
10	11635 SW Canyon Road	26



Existing



Future



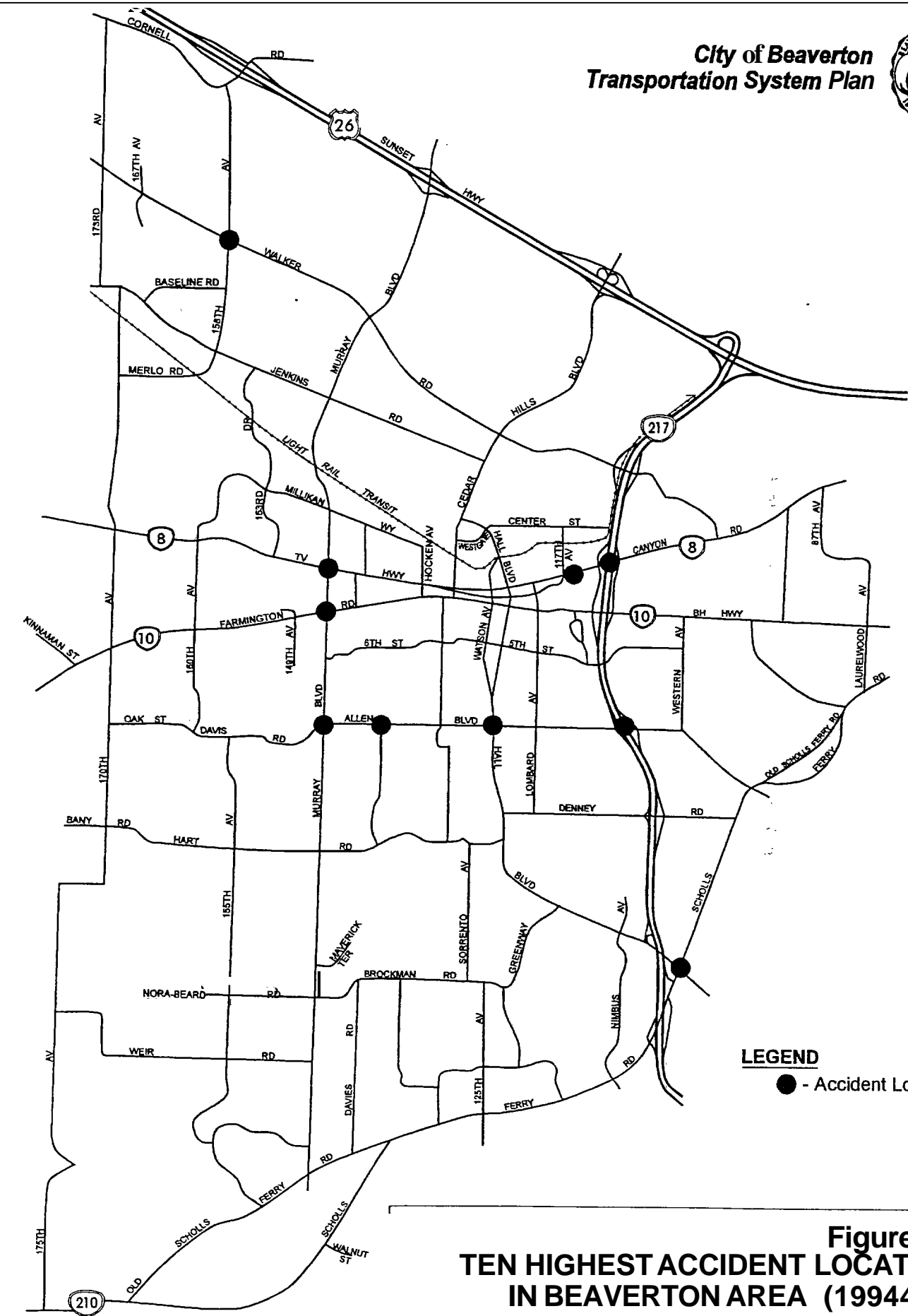
Existing



Future

FIGURE 8-27
SW 173rd Ave. / SW 174th Ave. at US 26

City of Beaverton
Transportation System Plan



Everyone of the top ten accident sites is listed for capacity improvements. **As** the capacity improvements are made, safety enhancements can be incorporated into the design. In the short term, specific action plans should be prepared to address whether beneficial improvements at these locations can be made without affecting future plans.

Several strategies were evaluated for safety by **the** City of Beaverton Traffic Commission. These strategies aimed at providing the City with priorities that meet the goals and policies of the City. The City of Beaverton Traffic Commission ranked these strategies for safety. Each commissioner and public participant were assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Beaverton. The ranking of these safety strategies follows from most important to least important:

- Develop a citywide safety priority system which identifies high accident locations, ranks the locations and identifies safety mitigation measures
- Work with other agencies such **as** Washington County and ODOT to help prioritize and fund safety programs (coordinated approach)
- Address safety issues on an **as** needed basis
- Continue existing program (received no points)

One future issue with regard to safety involved the decision to go to three lanes from two lanes or five lanes from four lanes. National research has clearly demonstrated the benefits of providing a turning lane when daily traffic volumes exceed 15,000 vehicles per day¹⁴. While widening the street **can** commonly be viewed **as** pedestrian unfriendly, the potential impact of not having a turning lane is that accident rates will increase substantially (11 **to** 35 percent) on two lane roads compared to three lane roads.

One safety action that can have immediate impact is to condition all land use development projects that require access on city streets to maintain adequate sight distance. This should address all fixed or temporary objects (plants, poles, signs, etc.) that potentially obstruct sight distance. Any property owner, business, agency or utility that places or maintains fixed **or** temporary objects in the sight distance of vehicles, bicycles or pedestrians should be required to demonstrate that adequate sight distance is provided (per AASHTO).¹⁵

School safety was an issue raised at several of the public meetings through the development of the **TSP**. In setting priorities for the pedestrian action plan, school access was given a high priority to improve safety. However, beyond simply building more sidewalks, school safety involves education and planning. Many cities have followed guidelines provided by **FHWA** and ITE¹⁶. Implementing plans of this nature has demonstrated accident reduction benefits. However, this type of work requires staffing

¹⁴ *Multilane Design Alternatives for Improving Suburban Highways*, TRB NCHRP Report No. 282, March 1986.

¹⁵ "A Policy on Geometric Design of Highways and Streets", Green **Book** American Association of State Highway and Transportation Officials, 1994.

¹⁶ *Manual of Uniform Traffic Control Devices*, FHWA, 1988; Traffic Control Devices Handbook, FHWA, 1983; A Program for School Crossing Protection, Institute of Transportation Engineers.

and coordination by the School District **as** well **as** the City to be effective. **As** a response to this program, establishing an annual budget (say \$10,000 per year) would allow for incremental benefits to be achieved and determine effectiveness in Beaverton, without a major capital program.

MAINTENANCE

Preservation, maintenance and operation are essential to protect the City investment in transportation. The majority of current gas tax-revenues are used to maintain the transportation system. With increasing road inventory and the need for greater maintenance of older facilities, protecting and expanding funds for maintenance is critical.

A Pavement Management Program is a systematic method of organizing and analyzing information about pavement conditions to develop the most cost effective maintenance treatments **and** strategies. **As** a management tool, it aids the decision-making process by determining the magnitude of the problem, the optimum way to spend funds for the greatest return on the dollar, and the consequences of not spending money wisely. Beaverton maintains an annual program of pavement management and monitors conditions in setting priorities for overlays, slurry seals and joint sealing. With nearly 180 miles of roadway and 20 bridges to maintain, this is one of the largest transportation expenditures.

A pavement management program can be a major factor in improving performance in **an** environment of limited revenues. A pavement management program is not and should not be considered the answer to every maintenance question. It is a tool that enables the public works professional to determine the most cost-effective maintenance program. The concept behind a pavement management system is to identify that optimal rehabilitation time and to pinpoint the **type** of repair which makes the most sense. With a pavement management program, professional judgment is enhanced, not replaced.

The goal of the City of Beaverton's existing street maintenance program is "to preserve the City's street system, pedestrian pathways and bridges, assure total quality customer service in support of City Council Goals". The operations department performs preventive maintenance to the street system and responds immediately to emergency situations involving the street surface. Significant projects such **as** street overlays and seals are outsourced. **An** increased emphasis has been placed on preventative maintenance for arterial and collector streets due to damage and wear from unusually wet winters. The City of Beaverton has ordered but has not yet received (**as** of June 1997) computer software for their pavement management system. Additionally, the City has been retrofitting about 20 to 40 **ADA** sidewalk ramps per year.

Table 8-6 summarizes the existing street maintenance program for the City of Beaverton. Table 8-7 summarizes the street maintenance program budget.

	FY 1994-95 (Actual)	FY 1995-96 (Actual)	FY 1996-97 (Budgeted)	FY 1997-98 (Proposed)
Preventative maintenance to the street system	175.05 miles	175.05 miles	177.65 miles	177.65 miles
Bridge maintenance inspections	20 bridges	20 bridges	20 bridges	20 bridges
Number of bridge inspections completed	20	20	20	20

Note **FY=Fiscal Year**

Table 8-7
Street Maintenance Budget Summary¹⁸

Requirements	FY 1994-95 (Actual)	FY 1995-96 (Actual)	FY 1996-97 (Budgeted)	FY 1997-98 (Proposed)	FY 1997-98 (Adopted)
Personal Services	\$ 450,599	\$ 417,359	\$ 452,669	\$ 470,847	\$ 470,847
Materials and Services	\$ 127,319	\$ 140,236	\$ 185,940	\$ 148,650	\$ 148,650
Capital Outlay	\$ 444,519	\$ 618,147	\$ 677,311	\$ 670,750	\$ 670,750
Transfers	\$ 373,739	\$ 280,803	\$ 332,883	\$ 445,808	\$ 445,808
Total	\$1,396,176	\$1,456,545	\$1,648,803	\$1,736,055	\$1,736,055

Note **FY=Fiscal Year**

A critical concept is that pavements deteriorate 40 percent in quality in the first 75 percent of their life. However, there is a rapid acceleration of this deterioration later, so that in the next 12 percent of life, there is another 40 percent drop in quality. A pavement management system can identify pavements before this rapid deterioration starts so that preventative maintenance can be applied. These fixes are generally one-fifth to one-tenth the cost required after a pavement is 80 percent deteriorated. Figure 8-29 illustrates the pavement life cycle. For this reason, support of gradual increases to the gas tax to support maintenance is critical.

Strategies

Strategy 1- "No maintenance program"

If nothing is done to improve pavement surface condition, the City's ability to maintain its streets will fall far behind its possible resources as the number of paved roads in good condition diminish and the amount of lane miles in need of rehabilitation increase. This strategy did not receive any points by the Traffic Commission.

¹⁷ Based on fax received from Pete Davis, City of Beaverton Operations Department, June 26, 1997.

¹⁸ Ibid.

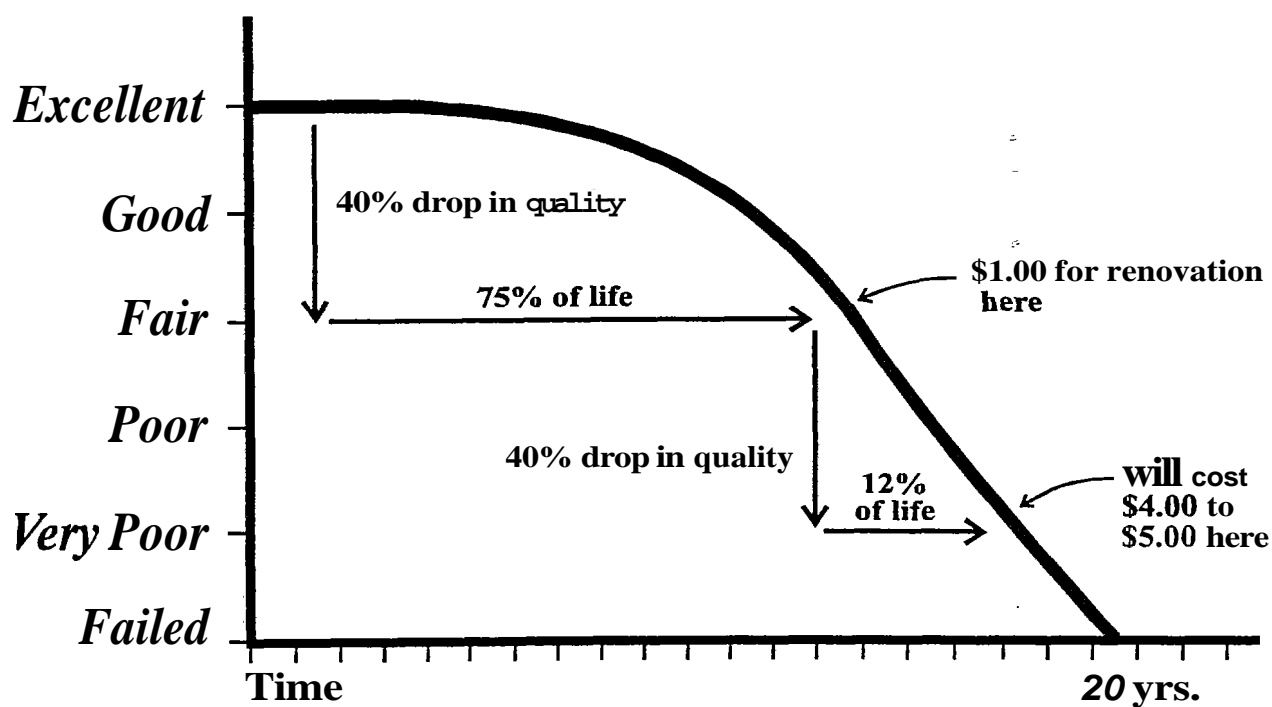


Figure 8-29
PAVEMENT LIFE CYCLE

Strategy 2 - "Maintain at highest level"

A strategy where the pavement condition is maintained at the highest level resulting in high expenditures. Maintenance already consumes the majority of the gas tax fund the City receives and a higher level would deplete these funds and require supplemental revenue. This strategy did not receive any points by the Traffic Commission or public participants.

Strategy 3 - "Maintain roadways **using** a need based approach which addresses current and future needs **as** they arise"

A "need based" strategy seeks to address current and future needs as they arise, so that all roads are maintained in good pavement condition.

Strategy 4 - "Maintain roadways using a balanced approach which develops a pavement management system and budget to address **needs** over **a** ten year period"

A "balanced" approach addressing pavement management needs in Beaverton would spread estimated expenditures over the next ten years.

These strategies were evaluated for maintenance by the City of Beaverton Traffic Commission. These strategies aimed at providing the City with priorities that meet the goals and policies of the City. The City of Beaverton Traffic Commission and the public ranked these strategies for maintenance. Each commissioner and public participant were assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Beaverton. The ranking of these maintenance strategies follows from most important to least important:

- Maintain roadways using a balanced approach which develops a pavement management system and budget to address needs over a ten year period (65 % of points)
- Maintain roadways using a need based approach which addresses current and future needs **as** they arise (35 % of points)

NEIGHBORHOOD TRAFFIC MANAGEMENT

Neighborhood Traffic Management (NTM) is a term that has been used to describe traffic control devices typically used in residential neighborhoods to slow traffic or possibly reduce the volume of traffic. NTM is descriptively called traffic calming, due to its ability to improve neighborhood livability.

Beaverton has been active in testing and implementing NTM measures such as speed humps, chokers, pavement texturing, circles, chicanes, and other elements. The City has no formalized NTM program and has been responding to community group needs on a case by case basis. The following are examples of neighborhood traffic management strategies:

- chokers
- speed humps
- traffic circles
- medians
- landscaping
- curb extensions
- narrow streets
- closing streets
- photo radar
- on-street parking
- selective enforcement
- neighborhood watch
- speed wagon

Typically, NTM can receive a favorable reception by residents adjacent to streets where vehicles travel at speeds above 30 MPH. However, NTM can also be a very contentious issue within and between neighborhoods, being viewed as moving the problem rather than solving it, impacting emergency travel or raising liability issues. A number of streets in Beaverton have been identified in the draft functional classification as neighborhood routes. These streets are typically longer than the average local street and would be appropriate locations for discussion of NTM applications. A wide range of traffic control devices are being tested throughout the region, including such devices as chokers, medians, traffic circles and speed humps. However, no standards have been developed in Beaverton yet. NTM traffic control devices must be tested within the confines of Beaverton before guidelines are developed for implementation criteria and applicability. Also, NTM should be considered in an area wide manner to avoid shift impacts between areas and only be applied where a majority of neighborhood residents agree that it should be done (via petition). Strategies for NTM seek to reduce traffic speeds on neighborhood routes, thereby improving livability in Beaverton. Research of traffic calming measures demonstrates their effectiveness in reducing vehicle speeds. Table 8-8 outlines nationwide research of over 120 agencies in North America.

It is recommended that the City develop a NTM program. This program can build off City experience and success and be used to prioritize implementation and address issues on a systematic basis rather than a reactive basis. Criteria may be established for the appropriate application of NTM in the City. This would address warrants, special conditions for functional classifications other than neighborhood routes and the required public process. Most importantly, the goals and policies of this plan calls for land use development to outline potential impacts to neighborhoods caused by new development in an attempt to have new land uses design NTM features into their plan or as conditions minimizing future problems. Because of the contentious nature of NTM, it is essential to have broad representation of the neighborhood and area that may be impacted.

The City of Beaverton recently passed a property tax levy that included a three year funding element for neighborhood traffic management/calming and traffic signals. The NTM element of this funding source provides an initial program for the City to build from in establishing a citywide NTM program.

Table 8-8
NTM Performance

		Speed Reduction (MPH)			Volume Change (ADT)			
Measures	No. of Studies	Low	High	Average	Low	High	Ave.	Public Satisfaction
Speed Humps	262	1	11.3	7.3	0	2922	328	79%
Speed Trailer	63	1.8	5.5	4.2	0	0	0	90%
Diverters	39	-	-	.4	85	3000	1102	72%
Circles	26	2.2	15	5.7	50	2000	280	72%
Enforcement	16	0	2	2	0	0	0	71%
Traffic Watch	85	.5	8.5	3.3	0	0	0	98%
Chokers	32	2.2	4.6	3.3	45	4100	597	79%
Narrow Streets	4	5	7	4.5	0	0	0	83%

SOURCE: *Survey of Neighborhood Traffic Management Performance and Results, ITE District 6, by R S. McCourt, July 1977.*

PARKING

Parking has typically been a benign transportation issue in the past for Beaverton. New land uses were required to provide the code designated number of parking spaces (or more) to assure there would be no impact to surrounding land uses (overflow parking). These parking ratios were developed based upon past parking demand characteristics of land use type. Most recently, parking has become an element of transportation planning policy through two actions. The adoption of the Transportation Planning Rule in 1991 and updated in December 1995 (sections 660-12-020(2g) and 660-12-045(5c)) and the Metro Functional Plan of November 1996, Title 2. By adopting the minimum and maximum parking ratios outlined in Title 2, the City will be able to address the TPR required reduction in parking spaces per capita over time.

Within the goals and policies for the City of Beaverton, Goal 4, Policy 2 addresses these requirements. It states ***"Limit the provision of parking to meet regional and state standards."***

Several strategies were evaluated for future parking by the Traffic Commission and the public. These strategies aimed at providing the City with parking priorities that meet the goals and policies of this plan. Each commissioner and public participant were assigned a certain number of points that he or she could allocate to each of the strategies according to his or her vision of priorities for the City of Beaverton. The ranking of these parking strategies follows from most important to least important:

- Shared parking
- Parking pricing
- Lower parking ratios for land uses within ¼ mile of LRT stations

- Parking needs should be reviewed by individual developments at the site plan review stage. Parking provisions should be compared to demand, as identified by ITE or DEQ.¹⁹
- Maximum Parking Ratios

One of the concerns with parking reduction policies is the impact to adjacent land uses should the vehicle needs of a site exceed the provision of parking. This will require critical site review to provide a balance between the policies to reduce vehicle trip making of new developments and the impacts to property owners.

The City of Beaverton should undertake a study of parking management for its regional center. This assessment should consider the benefits and impacts of parking pricing (including use of parking meters), share use parking and parking provision in areas well served by transit (LRT stations).

ACCESS MANAGEMENT

Access management is ~~important~~, particularly on high volume roadways, for maintaining traffic flow and mobility. Where local and neighborhood streets function to provide access, collector and arterial streets serve greater traffic volume. Numerous driveways, or street intersections, increase the number of conflicts and potential ~~for~~ accidents and decrease mobility and traffic flow. Beaverton, ~~as~~ with every city, needs a balance of streets which provide access ~~with~~ streets that serve mobility.

Several access management strategies were evaluated and ranked by the Traffic Commission and the public. The ranking of these access management strategies follows from most important to least important:

- Prohibit new single family access to arterials and collectors
- Set new City of Beaverton standards for all routes on new development using maximums and minimums
- Work ~~with~~ land use development applications to consolidate driveways
- Use medians on arterial routes to limit access
- Provide right in, right out driveways where appropriate
- ~~Close and~~ consolidate existing access points within 500 feet of freeway interchanges, ~~as~~ possible
- Allow no new access within 500 feet of freeway interchange ramps
- Limit traffic signals to public streets
- Develop minimum traffic signal spacing on arterials and collectors (e.g., 500 feet minimum; 800-1000 feet desirable)

¹⁹ *Parking Demand*, 2nd Edition, Institute of Transportation Engineers, 1987; and *Peak Parking Space Demand Study*, Oregon Department of Environmental Quality, by JHK & Associates, June 1995.

- Meet ODOT Access Management requirements on state highways (150 feet to 500 feet).
- Meet Washington County requirements on arterials (1,000 feet major/600 feet minor). This strategy did not receive any points.
- Develop City access requirements based on Metro Title 6 (660 feet). This strategy did not receive any points.

Based upon the public and Traffic Commission input the following recommendations are made for access management:

- Incorporate a policy statement regarding prohibition of new single family residential access on arterials and collectors. A design exception process should be outlined that requires mitigation of safety and NTM impacts. This addresses a long standing problem in Beaverton where property owners consume substantial stafftime on issues of residential fronting impacts.
- Set standards for access spacing (working with Washington County and ODOT) for arterials (600 foot minimum, 1,000 foot maximum) and collectors (200 foot minimum, 400 foot maximum).
- Recommend that ODOT use Access Management Category 4 for TV Highway and Farmington Road west of Murray Road and Category 5 east of Murray Road.
- Specific access management plans be developed for TV Highway and Cedar Hills Boulevard (north of Walker) to maximize the capacity of the existing facilities and protect their functional integrity.

TRANSPORTATION SYSTEM MANAGEMENT/ INTELLIGENT TRANSPORTATION SYSTEMS

Transportation System Management (TSM) focuses on low cost strategies to enhance operational performance of the transportation system. Measures that can optimize performance of the transportation system include signal improvements, intersection channelization, access management (noted in prior section), HOV lanes, ramp metering, rapid incident response, and programs that smooth transit operation. The most significant measure that can provide tangible benefits to the traveling public is traffic signal coordination and systems. This was the highest ranking strategy from the Traffic Commission. While Beaverton has had success in coordinating traffic signals (Beaverton Hillsdale Highway), there are still areas for improvement. Traffic signal system improvements can reduce the number of stops by 35 percent, delay by 20 to 30 percent, fuel consumption by 12.5 percent and emissions by 10 percent²⁰. This can be done without the major cost of roadway widening.

²⁰ Portland Regionwide Advanced Traffic Management System Plan. ODOT, by DKS Associates, October 1993.

The City of Beaverton Traffic Commission and the public ranked key TSM/ITS strategies, as noted below:

- Enhance traffic signal systems (areawide control, new technology model 2070 traffic signal controllers, etc.)
- Signal coordination for arterial system
- Bus queuejump lanes
- Transit priority signal systems
- Ramp metering
- High Occupancy Vehicle (HOV) lanes
- One-way streets
- Enhance detection system (video, etc.)

Several of the strategies were elements of an Intelligent Transportation System (**ITS**) plan being implemented regionally by ODOT and participating agencies. ITS focuses on a coordinated, systematic approach toward managing the region's transportation multi-modal infrastructure. ITS is the application of new technologies with proven management techniques to reduce congestion, increase safety, reduce fuel consumption and improve air quality. One element of ITS is Advanced Traffic Management Systems (**ATMS**). ATMS collects, processes and disseminates real-time data on congestion alerting travelers and operating agencies, allowing them to make better transportation decisions. Examples of future ITS applications include routine measures such as "smart" ramp meters, automated vehicle performance (tested recently in San Diego), improved traffic signal systems, improved transit priority options and better trip information prior to making a vehicle trip (condition of roads - weather or congestion, alternative mode options - a current "real time" schedule status, availability/pricing of retail goods). Some of this information will be produced by Beaverton, but most will be developed by ODOT or other ITS partners (private and public). The information will be available to drivers in vehicles, people at home, at work, at events or shopping. The Portland region is just starting to implement ITS and the City of Portland and ODOT have already developed their own ITS strategic plan.

One of the transportation system management measures that will have greater impact on peak period travel in the future is ramp metering of US 26 and ORE 217. ODOT has been ramp metering freeway ramps for these facilities since the early 1990s. This measure has been used to manage overall traffic flow on the freeways and to provide more uniform merge rates at the ramp terminals (to improve safety). The net result of this operation is that vehicles are stored on the freeway on-ramps. While at the initiation of ramp metering vehicle queues could easily be accommodated on the ramps, recently ramps such as the Cornell Road (eastbound) and Beaverton Hillsdale Highway (southbound) ramps have queues reaching back to the arterials. The existing two lane ramp design has been used on each ramp. However, in the future, it may be necessary to consider greater storage areas and other management techniques to effectively manage the freeway flows with ramp metering while not impacting arterial operation by having queues to spill back onto the adjacent streets. The City should work with Washington County and ODOT (particularly as US 26 and ORE 217 are widened and reconstructed) to develop strategies that seek to reduce the impact of ramp metering on adjacent arterial operation. Measures such as added ramp storage, ITS strategies including "smart HOV bypasses" (similar to the Cornell Road ramp), end of queue detection and added arterial turn lane storage approaching ramps should be considered.

As a recommendation of this plan, Beaverton should pursue development of a strategic plan for ITS to proactively identify opportunities to improve system performance and operation. A signal optimization program should be developed city wide for all arterials and collectors. The City should **work** with ODOT to develop strategies for smart ramp meters.

TRUCKS

Efficient truck movement plays a vital role in the economical movement of raw materials and finished products. The establishment of through truck routes provides for this efficient movement while at the same time maintaining neighborhood livability, public safety and minimizing maintenance costs of the roadway system. To accomplish this, a map of through **truck** routes in Beaverton has been developed (Figure 8-30). This is aimed at addressing the through movement of trucks, not the local deliveries. The objective of this route designation is to allow these routes to focus on design criteria that is “truck friendly”, i.e., 12 foot travel lanes, longer access spacing, 35 foot (or larger) curb returns and pavement design that accommodates a larger share of trucks. Because these routes are through and relate to regional movement, the Metro regional freight system was reviewed. The Draft Regional Transportation Plan²¹ includes the following routes in the regional freight system in Beaverton, which are consistent with the city map:

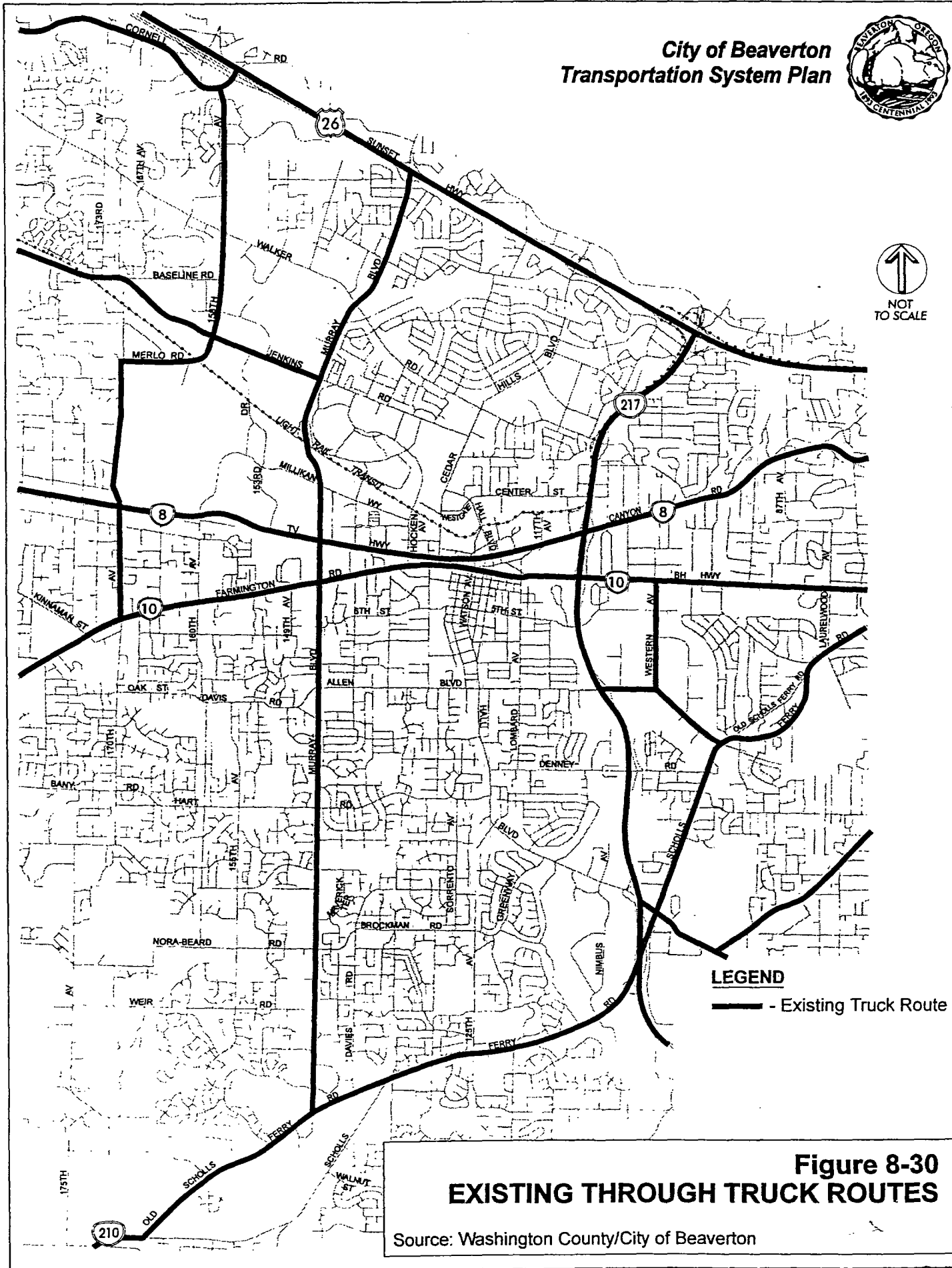
- | | |
|--|--------------------|
| • Sunset Highway (US 26) | Main Roadway Route |
| • Highway 217 (ORE 217) | Main Roadway Route |
| • TV Highway (west of ORE 217) | Road Connector |
| • Farmington Road (between ORE 217 and Cedar Hills Blvd) | Road Connector |
| • Murray Boulevard (north of TV Highway) | Road Connector |
| • 158 th Avenue (between Cornell Road and Jenkins Road) | Road Connector |
| • Jenkins Road (between 158 th Avenue and Murray) | Road Connector |
| • Hwy 217 ramps at Allen, Denney, Hall, Scholls Ferry | Road Connector |

CRITERIA

Beaverton’s Traffic Commission, Technical Advisory Committee and the public created a set of goals and policies to guide trucks and goods movement in Beaverton (see Chapter 2). Several of these policies pertain specifically to trucks. These goals and policies are the criteria that all truck related improvements or changes in Beaverton should be measured against to determine if they conform to the intended vision of the City.

²¹ *Draft Regional Transportation Plan, Metro, Draft 2.1*, March 22, 1997.

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Goal 3, Policy 8: Maintain access management standards for arterial and collector roadways consistent with City, County and State requirements to reduce conflicts between vehicles and trucks, as well as conflicts between vehicles and pedestrians.

Goal 6, Policy 1: Designated arterial routes and freeway access areas in Beaverton are essential for efficient movement of goods; design these facilities and adjacent land uses to reflect the needs of goods movement.

Goal 6, Policy 5: Provide safe routing of hazardous materials consistent with federal guidelines and provide for public involvement in the process.

STRATEGIES

Several strategies were evaluated by the Traffic Commission, Technical Advisory Committee and public for future truck/freight related projects in Beaverton. These strategies are aimed at providing the City with priorities to direct its funds toward truck related projects that meet the goals and policies of the City:

Strategy 1 - “Allow trucks to use all streets in Beaverton for through movement and design streets accordingly”

This strategy did not receive any points by the Traffic Commission or public.

Strategy 2 - “Designate through goods movement and service routes only to arterials”

This strategy focuses trucking activity in Beaverton on the arterial roadways only.

Strategy 3 - “Designate through goods movement as a sub-set of arterials and design to accommodate trucks”

This strategy focuses trucking activity in Beaverton on specified arterial roadways with design accommodations. This was the highest **ranking** strategy by the Traffic Commission and public participants.

Strategy 4 - “Strategy 3 without design accommodations for trucks”

This strategy focuses trucking activity in Beaverton on specified arterial roadways without design accommodations. This strategy did not receive any points from the Traffic Commission or public.

Strategy 5 - “Strategy 3 with only a selected sub-set of routes with “truck friendly” design accommodations”

This strategy focuses trucking activity in Beaverton on specified arterial roadways with a selected sub-set of routes with “truck friendly” design accommodations. This was the second highest ranking strategy by the Traffic Commission and public.

The map of truck routes is provided for guidance in designing streets in Beaverton. It is recommended that **truck** movement be given special consideration on these routes.